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| Candidate session number | | | |
| Candidate name | | | |
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| School name | | | |
| Examination session (May or November) | MAY | Year | 2012 |

Diploma Programme subject in which this extended essay is registered: ECONOMICS

(For an extended essay in the area of languages, state the language and whether it is group 1 or group 2.)

Title of the extended essay: TO WHAT EXTENT THE RISING COE PRICES AFFECT THE DEMAND FOR NEW AND USED CARS BY THE CONSUMER POPULATION AND HENCE AFFECT THE REVENUE GENERATED BY SINGAPOREAN ECONOMY FOR THE PERIOD 2012-2016?

Candidate's declaration

If this declaration is not signed by the candidate the extended essay will not be assessed.

The extended essay I am submitting is my own work (apart from guidance allowed by the International Baccalaureate).

I have acknowledged each use of the words, graphics or ideas of another person, whether written, oral or visual.

I am aware that the word limit for all extended essays is 4000 words and that examiners are not required to read beyond this limit.

This is the final version of my extended essay.

Candidate's signature: _____ Date: 29/2/2012

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A: 096141 B: ☒

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Comments

Please comment, as appropriate, on the candidate's performance, the context in which the candidate undertook the research for the extended essay, any difficulties encountered and how these were overcome (see page 13 of the extended essay guide). The concluding interview (viva voce) may provide useful information. These comments can help the examiner award a level for criterion K (holistic judgment). Do not comment on any adverse personal circumstances that may have affected the candidate. If the amount of time spent with the candidate was zero, you must explain this, in particular how it was then possible to authenticate the essay as the candidate's own work. You may attach an additional sheet if there is insufficient space here.

_____ is a student of IB Economics - HL.
She was interested to study the impact of the rising CO₂ prices on the demand for new and used cars and hence the revenue generated by Singapore.
She has used a vast range of data - both primary & secondary.

The challenge for _____ was to arrive at an equation to predict the future CO₂ prices and hence the revenue for the government. To do this she went an extra mile to learn the workings of an econometric model and how it could be used.

She had high levels of engagement throughout the Extended Essay process and is a highly organised individual who met all the stipulated deadlines.

I have read the final version of the extended essay that will be submitted to the examiner.

To the best of my knowledge, the extended essay is the authentic work of the candidate.

I spent 2 hours with the candidate discussing the progress of the extended essay.

Supervisor's signature _____

Date: 29/2/2012

Assessment form (for examiner use only)

Candidate session number

Assessment criteria

| Achievement level | | | |
|-------------------|---|---------|-----------------|
| First examiner | | maximum | Second examiner |
| 2 | ✓ | 2 | |
| 2 | ✓ | 2 | |
| 4 | ✓ | 4 | |
| 4 | ✓ | 4 | |
| 4 | ✓ | 4 | |
| 4 | ✓ | 4 | |
| 4 | ✓ | 4 | |
| 2 | ✓ | 2 | |
| 4 | ✓ | 4 | |
| 2 | ✓ | 2 | |
| 4 | ✓ | 4 | |

Total out of 36

36

Clearly an enormous amount of time & effort have been put into this. Excellent in all respects. To produce a really outstanding outcome. Well done!

Signature of first examiner: (in capital letters)

Signature of second examiner: (in capital letters)

Examiner number

Examiner number:

International Baccalaureate

Extended Essay

To what extent the rising COE prices affect the demand for new and used cars by the consumer population and hence affect the revenue generated by Singaporean Economy for the period 2012-2016?

Word Count: 3987

Exam Session: May 2012

May 2012

Economics



Acknowledgement

I would like to acknowledge and extend my heartfelt gratitude to my Economics teacher, Ms. Shefalika Kumar, for her continuous support and motivation throughout the IB diploma course for my extended essay.

I also want to sincerely thank my parents for encouraging me and providing me the support throughout the course of my extended essay.

I sincerely thank the Monetary Authority of Singapore, the Land Transport Authority, the Ministry of Trade and Industry and the Ministry of Statistics for publishing all the statistics and data for my secondary data.

A special thanks to all the consumers who spent their time in filling out the questionnaires and answering all questions asked to them.



Abstract

Singapore has one of the densest growth in vehicle population around the world. In order to curb this growth, the government reduced the supply of certificates of entitlement (COE). In response to this measure, the prices of the COE rose significantly which helped to arrive at my research question to investigate **the effect of the rising COE prices on the demand for new and used cars by the consumer population and hence affect the revenue generated by Singaporean Economy for the period 2012-2016.** RQ

Primary data was collected by handing out a questionnaire to 18 citizens representing the consumer market 17 of which were vehicle owners. The questionnaire consisted of 8 questions. Secondary data was collected through articles and statistics from newspapers and publications online. To predict the future COE prices, 5 econometrics models were created based on the 5 categories of COE. The total motor vehicle population and the total population of Singapore were taken as the independent variables. The future revenue was predicted as well as based on the present COE prices and the number of successful bids. S

Throughout the study, it is discovered that the demand for vehicles is falling but not at a fast rate. The future COE prices as per the econometrics models are predicted to rise. By comparing the demand for COE over two years, it is found that Category A, and B are relatively price inelastic and Category E, C and D are exceptions to the law of demand. There is a shift in demand from new to used vehicles because of increase in COE prices. In conclusion, the effect of COE prices is seen on the demand for vehicles wherein demand for new vehicles is decreasing and that of used vehicles is increasing as well as the revenue generated. C

296 Words

$\sum = 2$

✓

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Introduction

Singapore is a small country by size, which has limited amount of resources available for development. This hindrance is largely due to its size. *Singapore has very limited non-renewable resources. The economy is dependent on oil and natural gas imports*¹. Its economy is sustained on its exports that are largely comprised of machinery and equipment (including electronics), consumer goods, pharmaceuticals and other chemicals, mineral fuels². Yet *growth of vehicle population in Singapore is amongst the densest in the world*³.

*To further control the growth of vehicle population at a rate that is sustainable by Singapore's road infrastructure within its land constraint, the Vehicle Quota System (VQS) was introduced*⁴. This system limits the amount of COEs that can be bought in the country. COE refers to the Certificate of Entitlement, which needs to be acquired before buying a car. In order to achieve it, the bidders would have to bid in an auction which would likely lead to increase in the initial cost incurred by the consumer who wants to buy a car. As the COE prices continue to rise, *second-hand car sales grew as certificate of entitlement (COE) quotas shrivel – that is the reality of Singapore's regulated car market*⁵. Powered by a meager COE supply, *used-car sales are continuing to rev up*.⁶

*In 2010, the revenue collected from three categories of COE - Cat A (for cars below 1,600cc), Cat B (for cars above 1,600cc) and Cat E (the open category) - amounted to \$1,409,673,696 (assuming the full premium was paid for each of the successful COE bids)*⁷.

*While a reduced supply of COEs could drive up prices, if the much-talked about double-dip recession comes to pass and subsequently impacts Asia, that will hurt demand for the automobile market in Singapore and the region*⁸. Hence, in order to study this impact, I chose the research question 'To what extent the rising COE prices affect the demand for cars by the consumer population and hence affect the revenue generated by Singaporean Economy for the period 2012-2016'.

A = 2
B = 2

¹ <<http://www.tradechakra.com/economy/singapore/singapore-natural-resources-94.php>> Date accessed: 30th October

² <http://www.economywatch.com/world_economy/singapore/export-import.html> Date accessed: 31st October

³ <http://infopedia.nl.sg/articles/SIP_1005_2006-04-07.html> Date accessed: 08 October 2011

⁴ <http://infopedia.nl.sg/articles/SIP_1005_2006-04-07.html> Date accessed: 08 October 2011

⁵ <<http://cars.st701.com/resources/index.php?c=article&aid=13498&title=How-to-break-the-illusion-on-used-car-prices>> Date accessed: 20th January 2012

⁶ <http://www.straitstimes.com/BreakingNews/Singapore/Story/STIStory_657470.html> Date accessed: 30th October

⁷ The Business Times, 08 January 2011: - Date accessed: 30th October

⁸ <<http://motoring.asiaone.com/Motoring/News/Story/A1Story20111006-303560.html>> Date accessed: 09 October 2011

METHODOLOGY:

In this investigation, both primary and secondary data were used. Primary data was collected in the form of a questionnaire consisting of 8 questions, filled in by 17 vehicle owners and 1 non-vehicle owner. Secondary data was acquired through the Internet, newspaper articles, old archives and government publications. By analyzing all the data, the effect of prices of COE on the demand for vehicles is stated. The future COE prices were projected through econometric models with the secondary data found online. The future revenue of the government is projected by calculating the current revenue from COE bids.



THE RISING COE PRICES OVER 2009-2010

As the Certificate of Entitlement is divided into five categories, the entire essay has been categorized accordingly.

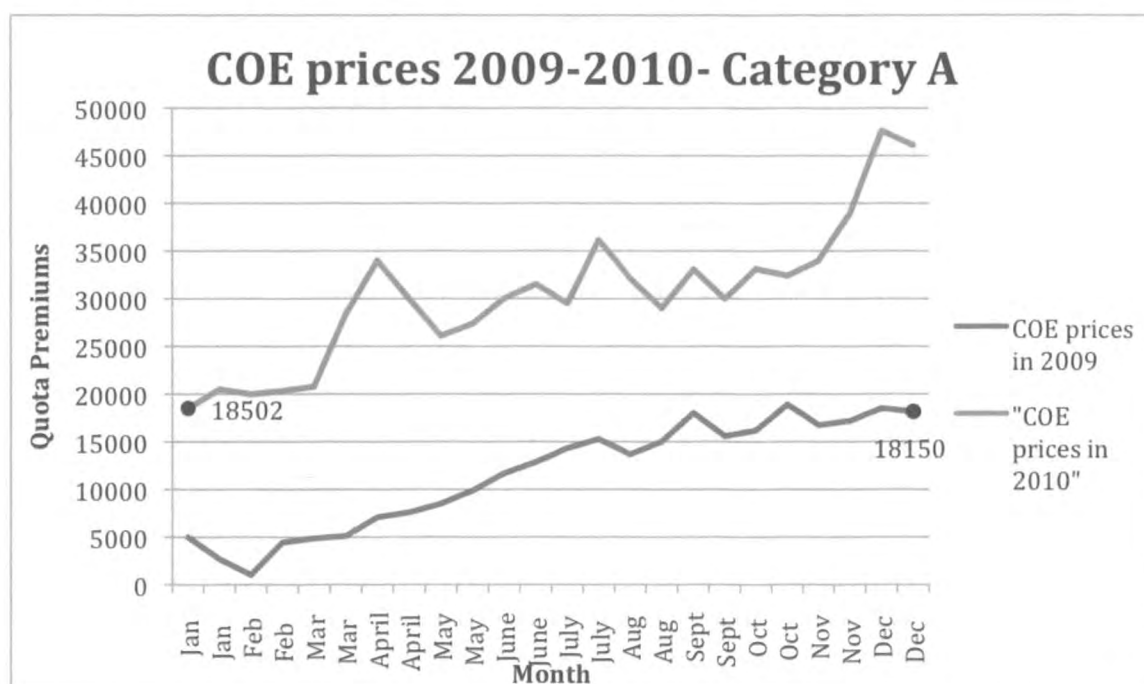
Comparing the prices over 2009-2010, there is an evident rise. The following graphs and tables chart this rise giving a clearer picture.

Table 1: Prices of COE of Category A 2009-2010

| Month | COE prices 2009(SGD) | COE prices 2010(SGD) |
|--------------------------|-----------------------------|-----------------------------|
| Jan(1 st Bid) | 5001 | 18502 |
| Jan(2nd Bid) | 2693 | 20501 |
| Feb(1st Bid) | 1020 | 19989 |
| Feb(2nd Bid) | 4450 | 20340 |
| Mar(1st Bid) | 4856 | 20802 |
| Mar(2nd Bid) | 5116 | 28389 |
| April(1st Bid) | 7090 | 34001 |
| April(2nd Bid) | 7586 | 30000 |
| May(1st Bid) | 8489 | 26102 |
| May(2nd Bid) | 9889 | 27389 |
| June(1st Bid) | 11690 | 30051 |
| June(2nd Bid) | 12859 | 31510 |
| July(1st Bid) | 14310 | 29501 |
| July(2nd Bid) | 15291 | 36162 |
| Aug(1st Bid) | 13658 | 32104 |
| Aug(2nd Bid) | 15019 | 29000 |
| Sept(1st Bid) | 18020 | 33089 |
| Sept(2nd Bid) | 15589 | 30001 |
| Oct(1st Bid) | 16201 | 33132 |
| Oct(2nd Bid) | 18899 | 32415 |
| Nov(1st Bid) | 16747 | 34001 |
| Nov(2nd Bid) | 17189 | 39000 |
| Dec(1st Bid) | 18502 | 47604 |
| Dec(2nd Bid) | 18150 | 46129 |



Fig 1: COE prices over 2009-2010 for Category A: Cars (1600 CC and below)



Comparing the two graphs in Fig 1, the prices of COE have risen. In the year 2009, the highest price quoted in the 2nd Open COE bidding exercise in December amounted to SGD 18,150. In 2010, 1st Open bidding exercise in January amounted to SGD 18,502. The highest QP⁹ of one year becomes the lowest QP of the next year.

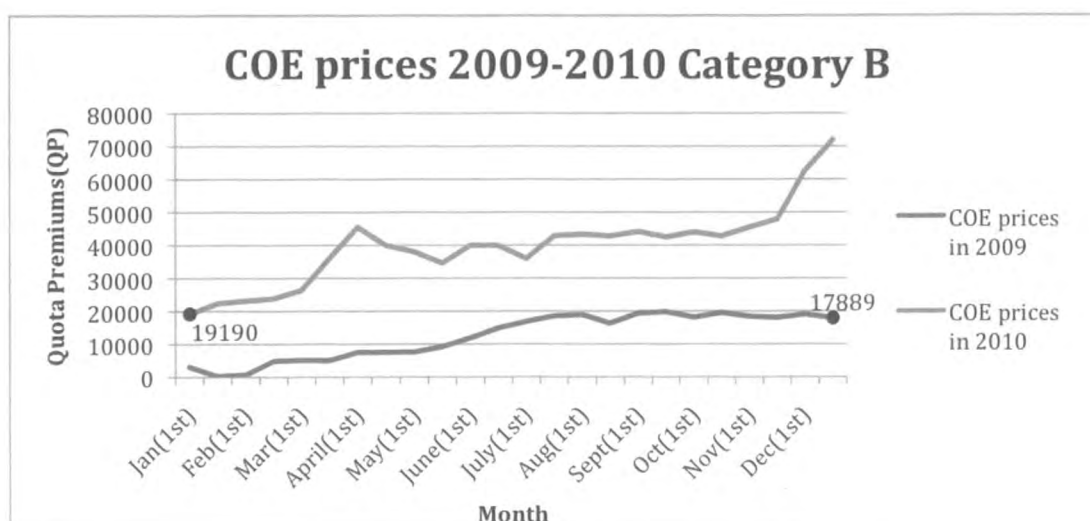
Table 2: Prices of COE of Category B 2009-2010

| Month | COE prices 2009(SGD) | COE prices 2010(SGD) |
|---------------------------|----------------------|----------------------|
| Jan(1 st Bid) | 3089 | 19190 |
| Jan(2 nd Bid) | 200 | 22400 |
| Feb(1 st Bid) | 689 | 23180 |
| Feb(2 nd Bid) | 4889 | 23889 |
| Mar(1 st Bid) | 5101 | 26389 |
| Mar(2 nd Bid) | 5001 | 36089 |
| Apr(1 st Bid) | 7501 | 45501 |
| Apr(2 nd Bid) | 7490 | 40001 |
| May(1 st Bid) | 7552 | 38000 |
| May(2 nd Bid) | 9180 | 34600 |
| June(1 st Bid) | 11889 | 40002 |
| June(2 nd Bid) | 14840 | 39911 |
| July(1 st Bid) | 16801 | 35909 |
| July(2 nd Bid) | 18501 | 42889 |
| Aug(1 st Bid) | 18890 | 43334 |

⁹ Quota premium

| | | |
|---------------|-------|-------|
| Aug(2nd Bid) | 16290 | 42810 |
| Sept(1st Bid) | 19280 | 44129 |
| Sept(2nd Bid) | 19801 | 42501 |
| Oct(1st Bid) | 18109 | 44000 |
| Oct(2nd Bid) | 19510 | 42801 |
| Nov(1st Bid) | 18389 | 45501 |
| Nov(2nd Bid) | 18002 | 47890 |
| Dec(1st Bid) | 19003 | 62502 |
| Dec(2nd Bid) | 17889 | 72001 |

Fig 2: COE prices over 2009-2010 for Category B: Cars (Above 1600cc)



Category B shows the same result as category A with the quota premium of the starting bid, 19190 SGD, in January 2010 close to QP of the ending bid SGD 17889 in the previous year.

Table 3: Prices of COE of Category C 2009-2010

| Month | COE prices 2009(SGD) | COE prices 2010(SGD) |
|--------------------------|----------------------|----------------------|
| Jan(1 st Bid) | 3502 | 19001 |
| Jan(2nd Bid) | 2900 | 20090 |
| Feb(1st Bid) | 2590 | 21390 |
| Feb(2nd Bid) | 4190 | 23501 |
| Mar(1st Bid) | 5300 | 27001 |
| Mar(2nd Bid) | 5600 | 32890 |
| April(1st Bid) | 7302 | 36511 |
| April(2nd Bid) | 6610 | 35556 |
| May(1st Bid) | 7100 | 32501 |
| May(2nd Bid) | 7600 | 29389 |
| June(1st Bid) | 9690 | 30189 |
| June(2nd Bid) | 12615 | 31689 |
| July(1st Bid) | 16888 | 31389 |
| July(2nd Bid) | 18801 | 30601 |

| | | |
|---------------|-------|-------|
| Aug(1st Bid) | 17410 | 30112 |
| Aug(2nd Bid) | 17501 | 30002 |
| Sept(1st Bid) | 16001 | 33000 |
| Sept(2nd Bid) | 15000 | 31001 |
| Oct(1st Bid) | 21692 | 30889 |
| Oct(2nd Bid) | 18110 | 30511 |
| Nov(1st Bid) | 16989 | 31006 |
| Nov(2nd Bid) | 17000 | 31202 |
| Dec(1st Bid) | 18289 | 32001 |
| Dec(2nd Bid) | 17900 | 33501 |

Fig 3: COE prices over 2009-2010 for Category C: Goods Vehicle and Bus

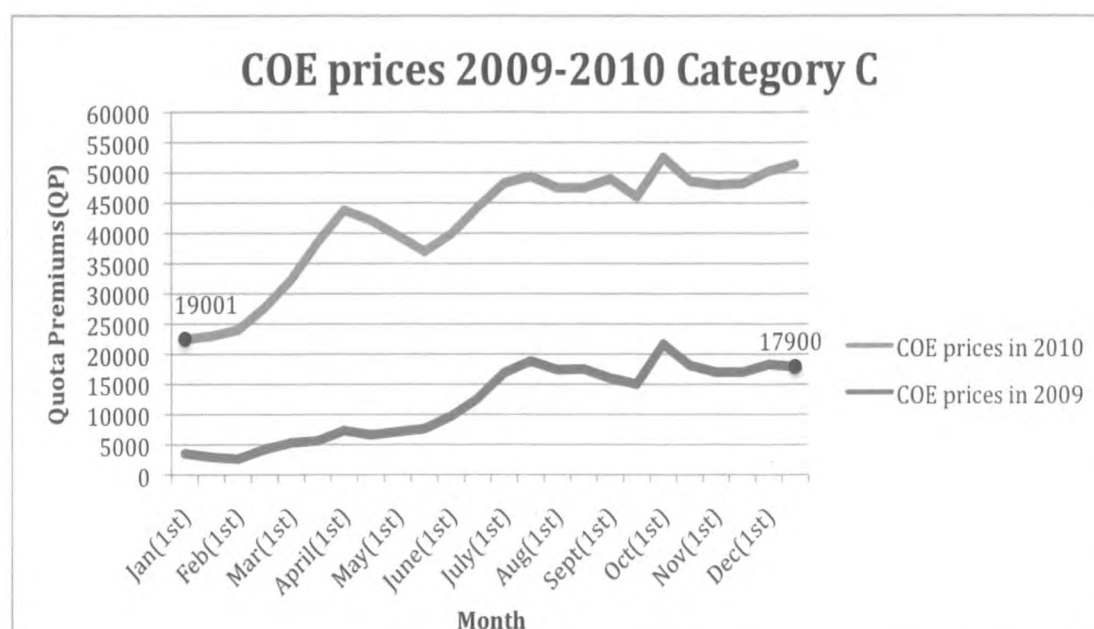


Table 4: Prices of COE of Category D 2009-2010

| Month | COE prices 2009(SGD) | COE prices 2010(SGD) |
|--------------------------|-----------------------------|-----------------------------|
| Jan(1 st Bid) | 1000 | 889 |
| Jan(2nd Bid) | 900 | 852 |
| Feb(1st Bid) | 701 | 852 |
| Feb(2nd Bid) | 801 | 1001 |
| Mar(1st Bid) | 958 | 1159 |
| Mar(2nd Bid) | 912 | 1200 |
| April(1st Bid) | 1053 | 1221 |
| April(2nd Bid) | 889 | 1253 |
| May(1st Bid) | 902 | 1252 |
| May(2nd Bid) | 810 | 1312 |
| June(1st Bid) | 889 | 1452 |
| June(2nd Bid) | 901 | 1454 |
| July(1st Bid) | 900 | 1320 |
| July(2nd Bid) | 889 | 1290 |
| Aug(1st Bid) | 902 | 1301 |
| Aug(2nd Bid) | 882 | 1251 |
| Sept(1st Bid) | 1051 | 1502 |
| Sept(2nd Bid) | 900 | 1452 |
| Oct(1st Bid) | 902 | 1502 |
| Oct(2nd Bid) | 931 | 1689 |
| Nov(1st Bid) | 902 | 1452 |
| Nov(2nd Bid) | 851 | 1502 |
| Dec(1st Bid) | 854 | 1701 |
| Dec(2nd Bid) | 851 | 1551 |

Fig 4: COE prices over 2009-2010 for Category D: Motorcycles

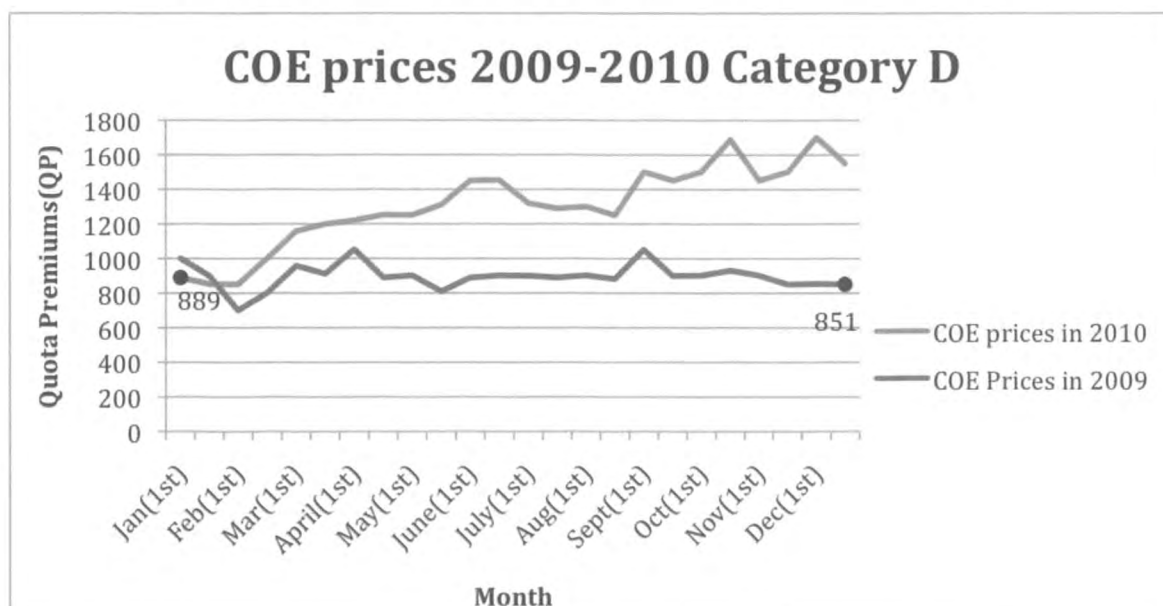
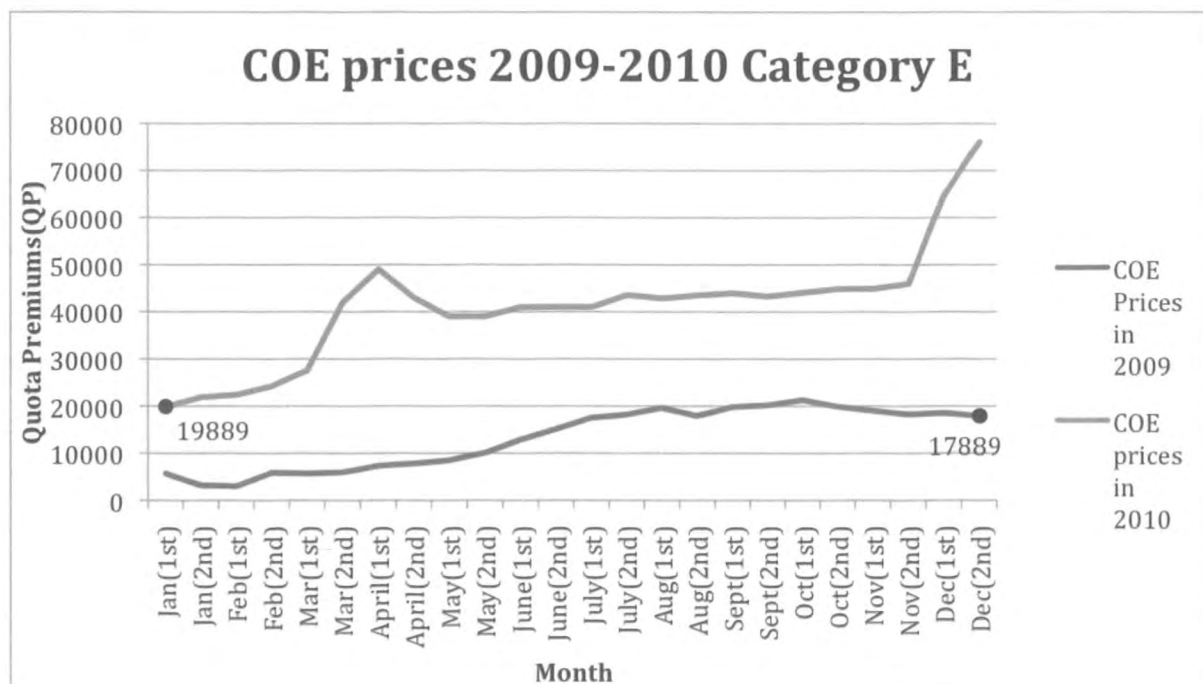


Table 5: Prices of COE of Category E 2009-2010

| Month | COE prices 2009(SGD) | COE prices 2010(SGD) |
|----------------------------|----------------------|----------------------|
| Jan(1 st Bid) | 5701 | 19889 |
| Jan(2 nd Bid) | 3200 | 21889 |
| Feb(1 st Bid) | 3000 | 22401 |
| Feb(2 nd Bid) | 5889 | 24229 |
| Mar(1 st Bid) | 5700 | 27590 |
| Mar(2 nd Bid) | 5982 | 42001 |
| April(1 st Bid) | 7326 | 49000 |
| April(2 nd Bid) | 7789 | 43003 |
| May(1 st Bid) | 8501 | 39002 |
| May(2 nd Bid) | 10046 | 39000 |
| June(1 st Bid) | 12901 | 41000 |
| June(2 nd Bid) | 15100 | 41006 |
| July(1 st Bid) | 17501 | 41010 |
| July(2 nd Bid) | 18189 | 43565 |
| Aug(1 st Bid) | 19629 | 42901 |
| Aug(2 nd Bid) | 17905 | 43501 |
| Sept(1 st Bid) | 19830 | 44001 |
| Sept(2 nd Bid) | 20200 | 43290 |
| Oct(1 st Bid) | 21301 | 44090 |
| Oct(2 nd Bid) | 19901 | 44900 |
| Nov(1 st Bid) | 19000 | 44890 |
| Nov(2 nd Bid) | 18267 | 46001 |
| Dec(1 st Bid) | 18509 | 64900 |
| Dec(2 nd Bid) | 17889 | 76102 |

Fig 5: COE prices over 2009-2010 for Category E: Open

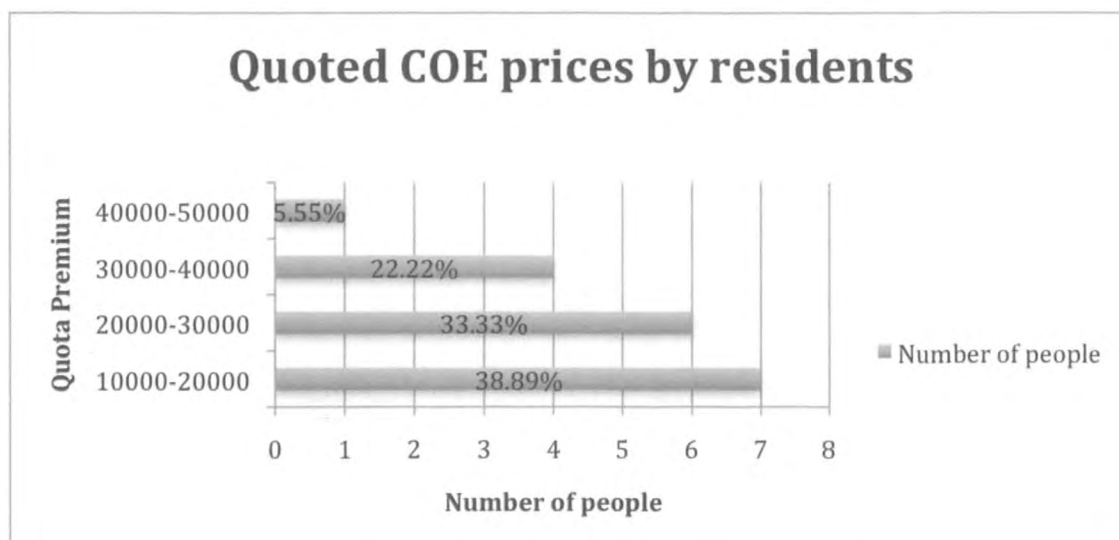


Category C, D and E can also be attributed with the similar characteristic as Category A and B.

Comparing the prices over two years, for all categories, there is a steady climb in the prices.

Primary data analysis:

Fig 6: Appendix of questionnaire¹⁰



The above bar graph analyses the quota premiums that the consumers are willing to quote for the Certificate of Entitlement.

Fig 7: COE prices- All categories 2011

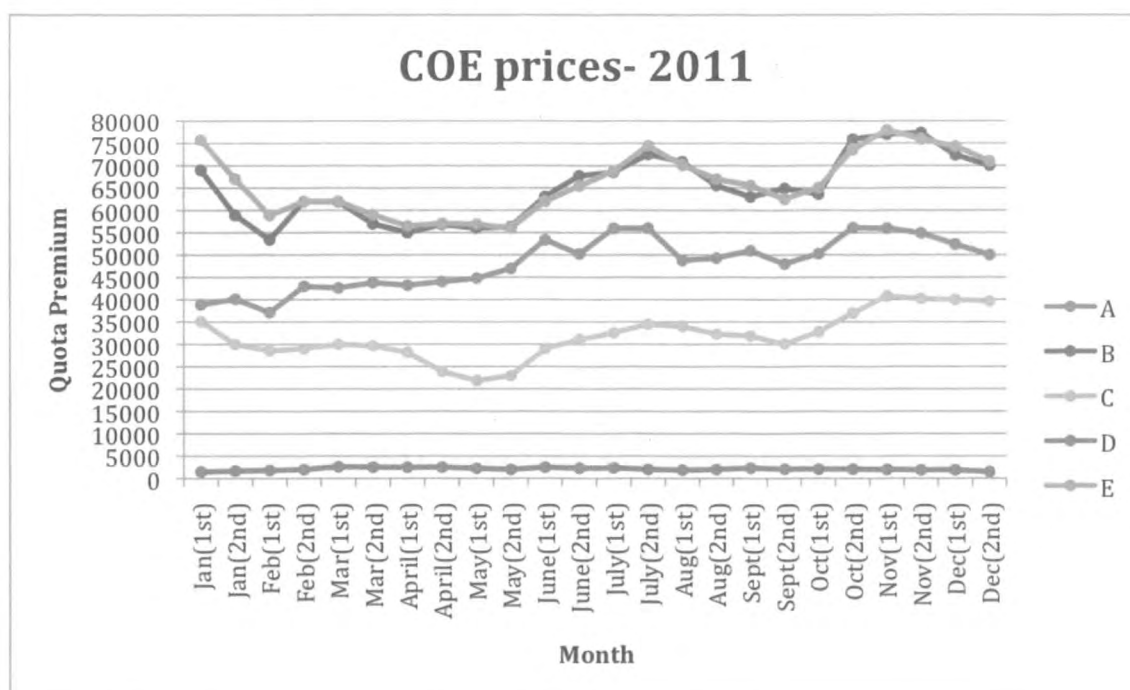


Fig 7 shows the prices of COE throughout the year of 2011 for all 5 categories¹¹. Category D is shown as a flat curve because the COE prices for this category range from SGD 1000 to 2500. Comparing Fig 6 and Fig 7, the prices quoted by the consumers do not match the current trend of COE prices as according to the quoted figures.

Table 6: COE prices quoted by consumers

| <u>COE prices quoted</u> | <u>% of Consumers</u> |
|---------------------------------|------------------------------|
| 10,000-20,000 | 39% |
| 20,000-30,000 | 33% |
| 30,000-40,000 | 22% |
| Above 40,000 | 5% |

Given the current COE prices, consumers are definitely waiting for a dip in the prices in the coming year.

In the latest COE bidding exercise in November 2011, the premiums in most categories fell¹². In conclusion, as the prices of the COE are rising, the demand by the consumers is falling to an extent as per the primary data.

¹¹ The five categories of COE are: Category A – 1600cc and below, Category B – 1600cc and above, Category C - Goods Vehicle and Bus, Category D - Motorcycles and Category E - Other

¹² <http://www.todayonline.com/Singapore/EDC111124-0000095/Inflation-continues-to-rise> Date accessed: 4th February 2012

Effect of COE prices in the year 2011 on the Singapore Micro-Economy

i. Law of Demand

The law of demand is *a microeconomic law stating that, all other factors being equal, as the price of a good or service increases, the quantity of goods or services¹³ demanded by the consumers, decreases and vice versa.*

Certificates of Entitlement (COEs) give Singaporeans the right to own a vehicle. Under the VQS¹⁴, vehicle growth could be pegged at 3% every year with the expansion of roads and highways taken into consideration¹⁵.

Singapore's vehicle growth rate is set to be revised downwards this month to further limit vehicle growth. The current growth rate stands at 1.5 per cent and was last reduced in 2009. It was halved from three per cent to the current 1.5 per cent¹⁶.

The Land Transport Authority (LTA) said 22,368 COEs will be made available between February and July. This is 3% or 695 certificates less than the previous six-month period. The new supply works out to a monthly quota of 3,728¹⁷. The rush to meet annual sales targets, coupled with anticipation of an even smaller supply of certificates of entitlement next year, pushed most COE prices higher¹⁸.

The first half of the year, from February to July, experienced high prices of COE with the shortage in COE premiums. As its supply decreased, its demand by the consumer increased due to fear of rising prices. This will result in even higher prices as shown in the table.

¹³ <<http://www.investopedia.com/terms/l/lawofsupply.asp#ixzz1aI3f10WW>>

Date Accessed: 09 October 2011

¹⁴ Vehicle quota system

¹⁵ <http://infopedia.nl.sg/articles/SIP_1005_2006-04-07.html>

Date accessed: 09 October 2011

¹⁶ <<http://veritas-lux.blogspot.com/2011/10/loi-tuck-yew-singapore-has-limited.html>>

Date Accessed: 10th January 2012

¹⁷ <<http://www.channelnewsasia.com/stories/singaporelocalnews/view/1103738/1/.html>>

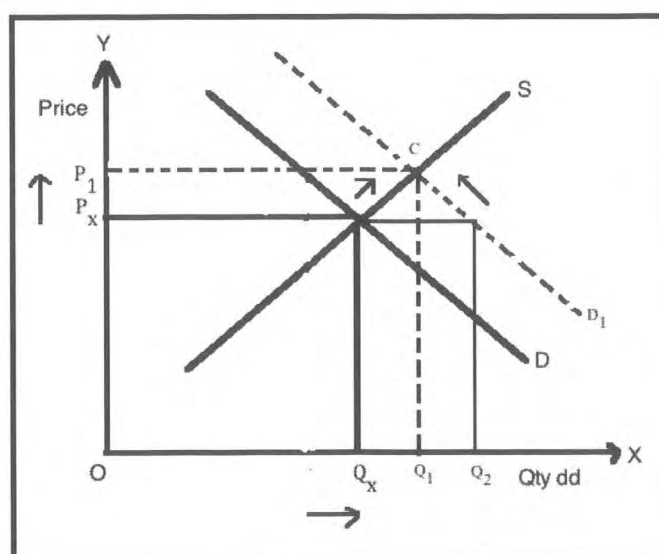
Date accessed: 11th January 2012

¹⁸ <<http://cars.st701.com/resources/index.php?c=article&aid=31134&title=COE-prices-higher-in-most-categories>> Date accessed: 15th January

Table 7: COE prices

| Category | COE Price(SGD) |
|----------|----------------|
| A | 56,002 |
| B | 72,501 |
| C | 34,502 |
| D | 2,012 |
| E | 74,490 |

Market forces are a major reason as to why the prices keep increasing. The market exists at equilibrium¹⁹ until disrupted by a change in the demand or supply. The demand and supply curve balance out the excess supply or demand present in the economy through the shifts of one of the curve.

Fig 8: Increase in demand of COE due to future expectations

In Fig 8, as the consumers expect the government to cut the supply of COE in the near future, they rush to buy COE at the given price. This increase in the demand pushes up its price. As the demand curve shifts, at the same price level OP_x , there is an increase in the quantity demanded. It increases from OQ_x to OQ_2 . Since there is excess demand, the market prices are pushed up due to which there is an upward movement along the demand curve called

¹⁹ The state of equilibrium that exists when the opposing market forces of demand and supply exactly offset each other and there is no inherent tendency for change.

contraction²⁰ and an upward movement on supply curve called expansion²¹. These movements continue till the new equilibrium point **c** is reached, wherein market prices increase and equilibrium quantity also increases.

The rising prices also act as a signal for the producers to produce more cars due to the increase in demand of COE premiums. It provides the suppliers an incentive to produce more, as their profit will increase. With reference to Fig. 9, as the price rises to settle at point **c**, the market chucks out Q_1Q_2 number of consumers, who are unable to afford the commodity at the equilibrium price, OP_1 .

ii. Elasticity of Demand

Price Elasticity of Demand (PED):

The price elasticity²² can be of different types:

- Perfectly inelastic
- Highly inelastic
- Unitary elastic
- Highly elastic
- Perfectly elastic

COE has a highly inelastic demand. With the shortage in the supply of COE due to government cuts, the prices shot up in the year 2011 as compared to the prices from the previous years 2009-2010. But the quantity demanded falls by a small amount as compared to percentage change in price.

It can be calculated by using the below formula:

$$PED = (-) \frac{\% \text{ change in quantity demanded}}{\% \text{ change in price}}$$

(-) indicates inverse relation between price and quantity demanded.

Each category has different a different elasticity. By categorizing the demand and price for all 5 categories, the elasticity for each has been calculated in the month of April and August.

²⁰ The upward movement along the demand curve due to change in price keeping other factors constant, is called contraction.

²¹ The upward movement along the supply curve due to change in price keeping other factors constant, is called expansion.

²² It is the responsiveness of the quantity of a commodity demanded to a change in its price, expressed as the percentage change in quantity demanded divided by the percentage change in price

Table 8: Elasticity of COE - April²³

| Category A: 1600cc and below | | | | | | |
|------------------------------|-------|---------------|---------------------------|-------------------------------|-------------------|----------------------------|
| Year | Quota | Quota Premium | Number of Successful Bids | % change in quantity demanded | % change in price | Price elasticity of demand |
| April 2010 | 706 | \$30,000 | 704 | -0.2159 | 0.4667 | -0.46 |
| April 2011 | 565 | \$44,000 | 552 | | | |

| Category B: Above 1600cc | | | | | | |
|--------------------------|-------|---------------|---------------------------|-------------------------------|-------------------|----------------------------|
| Year | Quota | Quota Premium | Number of Successful Bids | % change in quantity demanded | % change in price | Price elasticity of demand |
| April 2010 | 561 | \$40,001 | 549 | -0.2313 | 0.4199 | -0.55 |
| April 2011 | 423 | \$56,801 | 422 | | | |

| Category C: Goods vehicles and buses | | | | | | |
|--------------------------------------|-------|---------------|---------------------------|-------------------------------|-------------------|----------------------------|
| Year | Quota | Quota Premium | Number of Successful Bids | % change in quantity demanded | % change in price | Price elasticity of demand |
| April 2010 | 203 | \$35,556 | 203 | 0.3251 | -0.3278 | -0.99 |
| April 2011 | 277 | \$23,900 | 269 | | | |

| Category D: Motorcycles | | | | | | |
|-------------------------|-------|---------------|---------------------------|-------------------------------|-------------------|----------------------------|
| Year | Quota | Quota Premium | Number of Successful Bids | % change in quantity demanded | % change in price | Price elasticity of demand |
| April 2010 | 339 | \$1,253 | 311 | 0.2480 | 0.9968 | 0.25 |
| April 2011 | 326 | \$2,502 | 326 | | | |

²³ Appendix IV – Calculation of elasticities

| Category E: Other | | | | | | |
|-------------------|-------|---------------|---------------------------|-------------------------------|-------------------|----------------------------|
| Year | Quota | Quota Premium | Number of Successful Bids | % change in quantity demanded | % change in price | Price elasticity of demand |
| April 2010 | 390 | \$43,003 | 383 | -0.1409 | 0.3023 | -0.47 |
| April 2011 | 330 | \$56,001 | 329 | | | |

Table 9: Elasticity of COE - August²⁴

| Category A: 1600cc and below | | | | | | |
|------------------------------|-------|---------------|---------------------------|-------------------------------|-------------------|----------------------------|
| Year | Quota | Quota Premium | Number of Successful Bids | % change in quantity demanded | % change in price | Price elasticity of demand |
| August 2010 | 606 | \$29,000 | 606 | -0.0809 | 0.7000 | -0.12 |
| August 2011 | 557 | \$49,301 | 557 | | | |

| Category B: Above 1600cc | | | | | | |
|--------------------------|-------|---------------|---------------------------|-------------------------------|-------------------|----------------------------|
| Year | Quota | Quota Premium | Number of Successful Bids | % change in quantity demanded | % change in price | Price elasticity of demand |
| August 2010 | 482 | \$42,810 | 472 | -0.2521 | 0.5305 | -0.48 |
| August 2011 | 353 | \$65,521 | 353 | | | |

²⁴ Appendix IV- Calculation of elasticity

| Category C: Goods vehicles and buses | | | | | | |
|--------------------------------------|-------|---------------|---------------------------|-------------------------------|-------------------|----------------------------|
| Year | Quota | Quota Premium | Number of Successful Bids | % change in quantity demanded | % change in price | Price elasticity of demand |
| August 2010 | 206 | \$30,002 | 205 | 0.1561 | 0.0762 | 2.05 |
| August 2011 | 245 | \$32,289 | 237 | | | |

| Category D: Motorcycles | | | | | | |
|-------------------------|-------|---------------|---------------------------|-------------------------------|-------------------|----------------------------|
| Year | Quota | Quota Premium | Number of Successful Bids | % change in quantity demanded | % change in price | Price elasticity of demand |
| August 2010 | 335 | \$1,251 | 330 | 0.1576 | 0.5979 | 0.26 |
| August 2011 | 387 | \$1,999 | 382 | | | |

| Category E: Other | | | | | | |
|-------------------|-------|---------------|---------------------------|-------------------------------|-------------------|----------------------------|
| Year | Quota | Quota Premium | Number of Successful Bids | % change in quantity demanded | % change in price | Price elasticity of demand |
| August 2010 | 315 | \$43,501 | 315 | 0.5402 | 0.5402 | 0.12 |
| August 2011 | 337 | \$67,000 | 335 | | | |

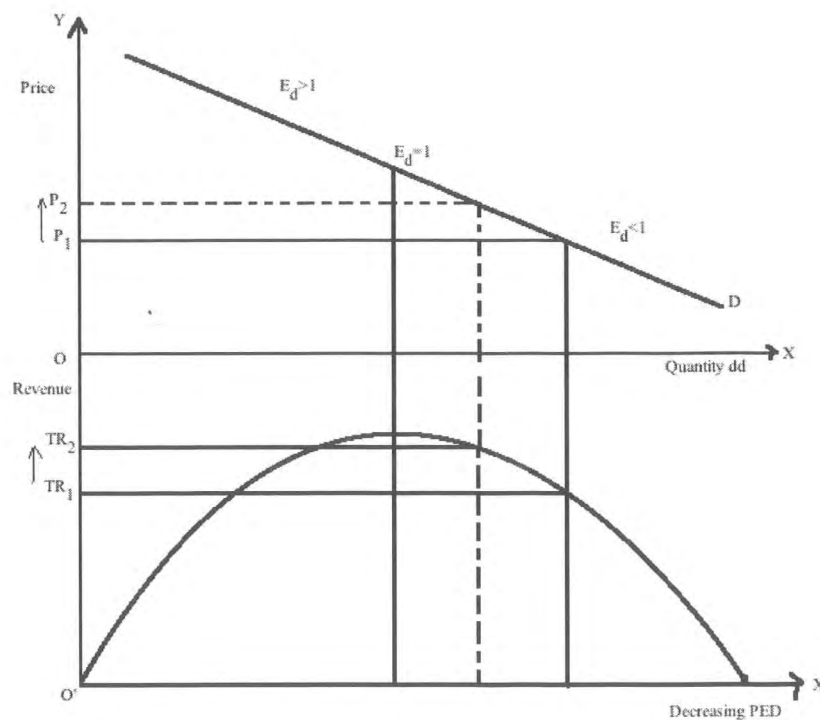
In the month of April and August, Category A and B are highly inelastic in nature as the absolute value of their elasticity is lesser than 1. Category D is an exception to the Law of Demand as its elasticity is positive. Its goods (i.e Motorcycles) can be giffen goods²⁵ as the demand for these goods increase along with the increase in their prices. However, the price elasticity for categories C and E changes from negative to positive in the two months, which indicates these categories, are exceptions as well. This was mainly because in Category E²⁶, COEs were bought for large cars as Category B had limited COEs, which were sold for relatively small cars at higher prices. Hence, even with the increase in price over the 4 months with the prices July peaking in all categories, the demand for Category C and E remained constant, giving rise to a positive elasticity.

²⁵ A Giffen Good is a good that experiences increased demand for when the price rises and decreased demand for when the price falls. It is an exception to the law of demand. However, a commodity is said to be a giffen good only if the income effect is greater than the substitution effect such that as prices rise, consumers' real income falls, money income remaining constant.

²⁶ Category E – Open category

According to the expenditure method of elasticity of demand, as the elasticity of Categories A and B are inelastic, the total revenue received from these categories will increase with the increase in price.

Fig 9: Relation between price elasticity of demand and total revenue



In Fig 9, as the price of the inelastic good increases from OP_1 to OP_2 , there is an upward movement on the total revenue curve. The Total revenue (TR) increases from TR_1 to TR_2 . **This implies the rising COE prices in the two inelastic categories will increase the government's revenue.**

As category C and E are exceptions, their elasticity will increase the government's revenue irrelevant of the nature of their elasticity. As if it is negative, it would be inelastic in nature, which is the case above. If their elasticity is positive in nature, its demand will still rise with the increasing price, thereby leaving the total revenue unaffected.



Effects of rising COE prices on Singapore's Economy

CPI Inflation:

The goods in the basket of commodities²⁷ are often adjusted periodically to account for changes in consumer habits²⁸. The items selected for pricing in CPI²⁹ are the more significant ones, which are likely to have price movements that are representative of a wider range of goods and services³⁰. COE prices directly affect the car sales, as it is the price to have the right to own a car. The high COE premiums imply that car prices will remain a significant contributor to CPI inflation for the rest of the year³¹. As vehicles are consumer priority, their prices will remain as an important contributor.

According to the Monetary Authority of Singapore, inflation will be around 5% this year and is expected to ease off to 2.5% - 3.5% in 2012 as the global economy weakens and demand for commodities lowers³².

High CPI inflation is predicted in Singapore's economy till the end of the year 2011.

Inflation is rearing its ugly head again. June CPI inflation out today registered 5.2% YoY after having peaked at 5.5% in January. Additionally, the Monetary Authority of Singapore has raised its full year inflation forecast for 2011 to 4-5% recently, up from 3-4% previously.³³

Transport inflation is the sustained increase in the general level of prices of transport in Singapore. The transport includes the public and private vehicle costs.

²⁷ The basket of commodities is a relatively fixed set of consumer products and services valued and used on an annual basis to track inflation in a specific market or country.

²⁸ <http://www.investopedia.com/terms/b/basket_of_goods.asp#ixzz1k5gm2E32> Date accessed: 20th January 2012

²⁹ It is an inflationary indicator that measures the change in the cost of a fixed basket of products and services, including housing, electricity, food, and transportation.

<<http://www.investorwords.com/1187/CPI.html>>

Date accessed: 10/02/12

³⁰ <<http://www.abs.gov.au/ausstats/abs@.nsf/Latestproducts/6461.0Main%20Features72011?opendocument&tabname=Summary&prodno=6461.0&issue=2011&num=&view=>>> Date accessed: 20th January 2012

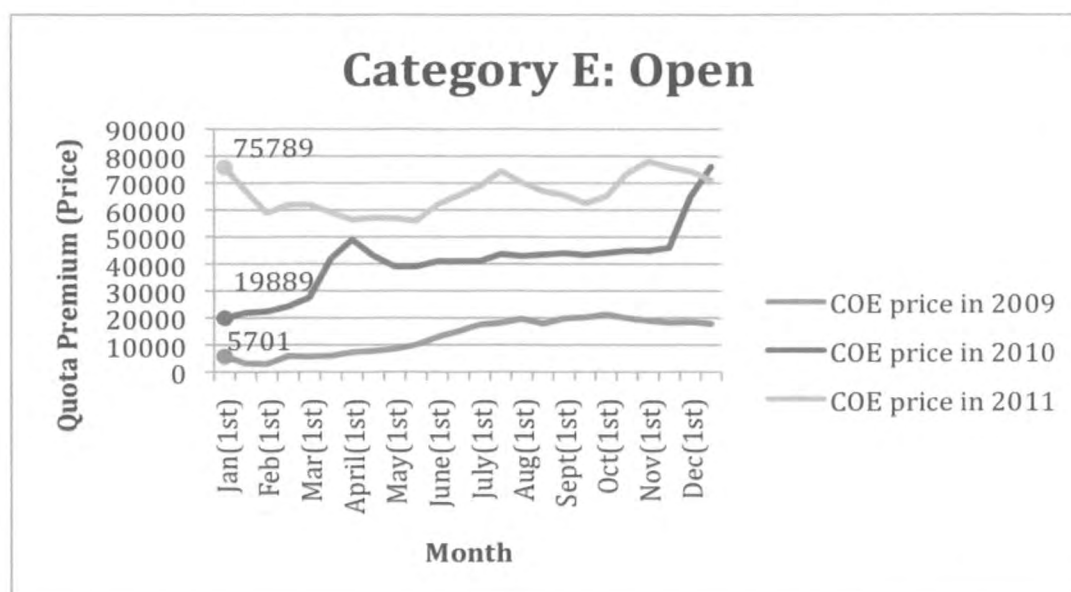
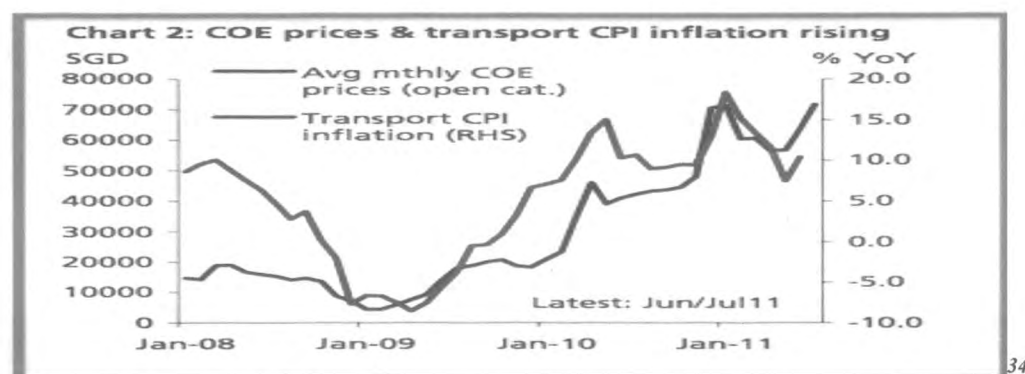
³¹ <http://www.mas.gov.sg/resource/eco_research/eco_dev_ana/inflation_monthly/2011/InflationJul11.pdf> Date accessed: 17th December 2011

³² <<http://www.enterpriseone.gov.sg/en/News/2011/Nov/111125%20October%202011%20Inflation%20Still%20High.aspx>>

Date accessed: 20th December 2011

³³ DBS Group Research

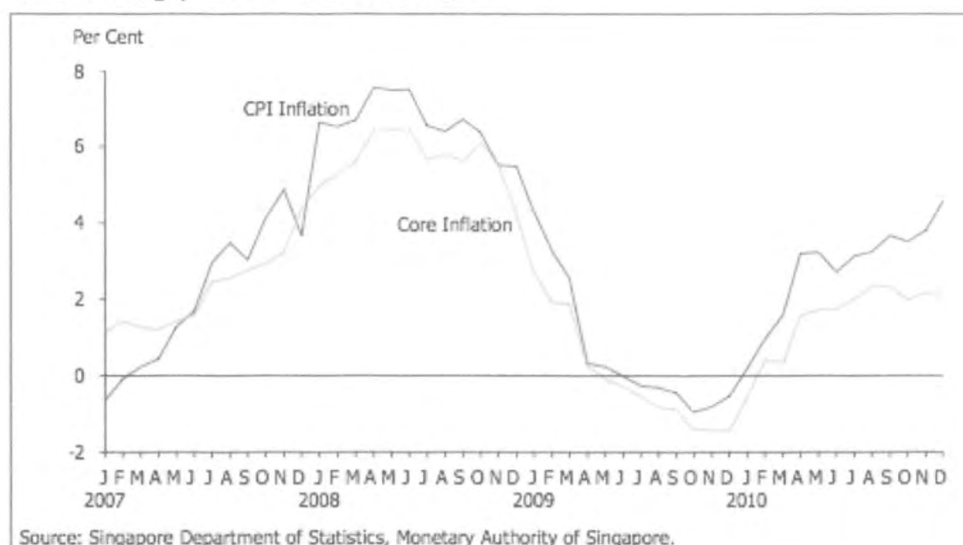
<[www.dbsvresearch.com/research%5Cdb%5Cresearch.nsf/\(vwAllDocs\)/B87CDDDEA021A021482578D80022B553/\\$FILE/sg_2011Jul25.pdf](http://www.dbsvresearch.com/research%5Cdb%5Cresearch.nsf/(vwAllDocs)/B87CDDDEA021A021482578D80022B553/$FILE/sg_2011Jul25.pdf)> Date accessed: 30th October 2011

Fig 10: COE prices over a span of 3 years: 2009-2011**Fig 11: Rising COE prices over the time-period of 4 years**

In Fig 10 and 11, the COE prices have been compared over 4 consecutive years. The general trend of these prices is their steady rise. Consumer Price index (CPI) is an inflationary indicator that measures the change in the cost of a fixed basket of products and services which includes housing, clothing, food, and transportation.

³⁴DBS Group Research

<[www.dbsvresearch.com/research%5Cdb%5Cresearch.nsf/\(vwAllDocs\)/B87CDDDEA021A021482578D80022B553/\\$FILE/sg_2011Jul25.pdf](http://www.dbsvresearch.com/research%5Cdb%5Cresearch.nsf/(vwAllDocs)/B87CDDDEA021A021482578D80022B553/$FILE/sg_2011Jul25.pdf)> Date accessed: 30th October 2011

Exhibit 1: Singapore's CPI Inflation in 2010

CPI inflation in Singapore picked up in 2010, after six consecutive months of year-on-year decline in the second half of 2009, to reach a two-year high of 4.6 per cent by December 2010 (Exhibit 1). The increase can be mainly attributed to higher prices of cars, oil-related items, food and service-related items such as tuition fees and holiday travel³⁵.

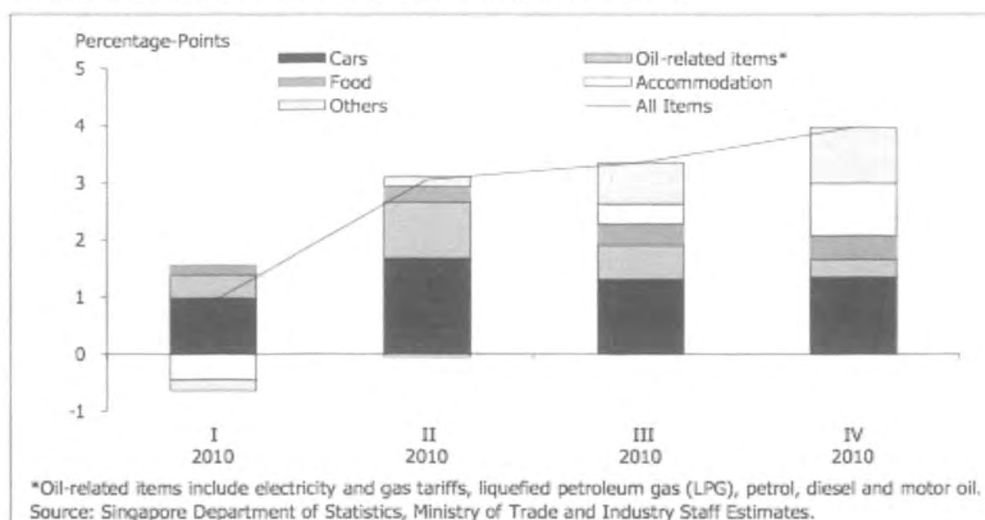
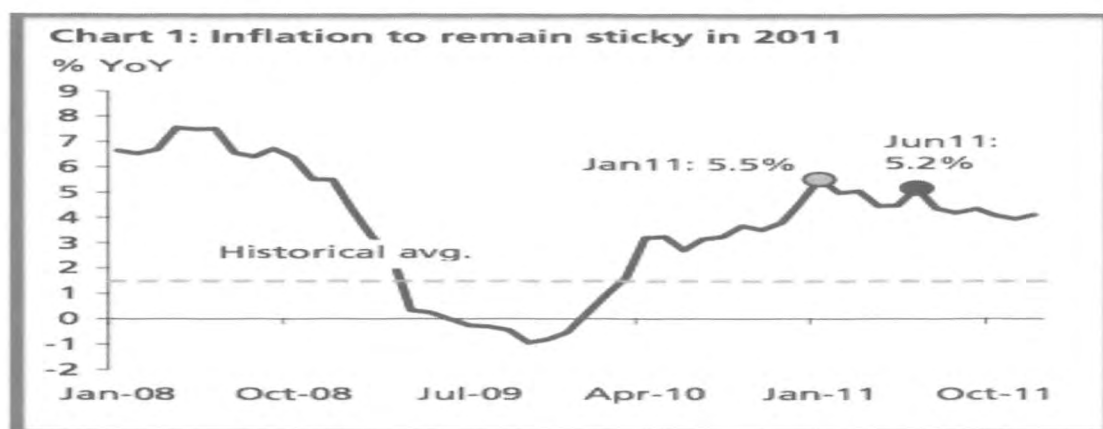
Exhibit 2: Main Contributors to Overall CPI Inflation in 2010

Exhibit 2 displays the main contributors of the rising CPI Inflation in 2010 over 4 quarters throughout the year. Higher car prices are the main contributors (considering car prices to be the cost of acquiring cars i.e COE prices). *The significant increase in COE premiums and higher petrol prices also drove transport costs by up 10.5 per cent³⁶.*

³⁵ <http://app.mti.gov.sg/data/article/24221/doc/FinalReport_AES_2010.pdf> Date accessed: 4th February 2012

³⁶ <<http://www.todayonline.com/Singapore/EDC111124-0000095/Inflation-continues-to-rise>> 4th February 2012

Fig12: Sticky Inflation in 2011



In Fig 12, selecting different months gives the comparison of the inflation rate over four consecutive years. From the year 2009, it has been creeping up steadily. It reached its highest peak at 5.5% in January 2011. As the year comes to an end, it stagnates at around 5.1%.

³⁷ DBS Group Research

<[www.dbsvresearch.com/research%5Cdb%5Cresearch.nsf/\(vwAllDocs\)/B87CDDDEA021A021482578D80022B553/\\$FILE/sg_2011Jul25.pdf](http://www.dbsvresearch.com/research%5Cdb%5Cresearch.nsf/(vwAllDocs)/B87CDDDEA021A021482578D80022B553/$FILE/sg_2011Jul25.pdf)>

Date accessed: 30th October 2011

Revenue from sales of Used cars:

As the prices of the COE have risen, there is a considerable effect on the demand of Used cars. It has risen along with the price. *Used cars have been zooming off showrooms like racecars, said second-hand car dealers that The New Paper on Sunday spoke to.*³⁸ Consumers rush to buy second hand cars. *As the COE is high, fewer people buy new car*³⁹.

Fig 13: Appendix Questionnaire⁴⁰

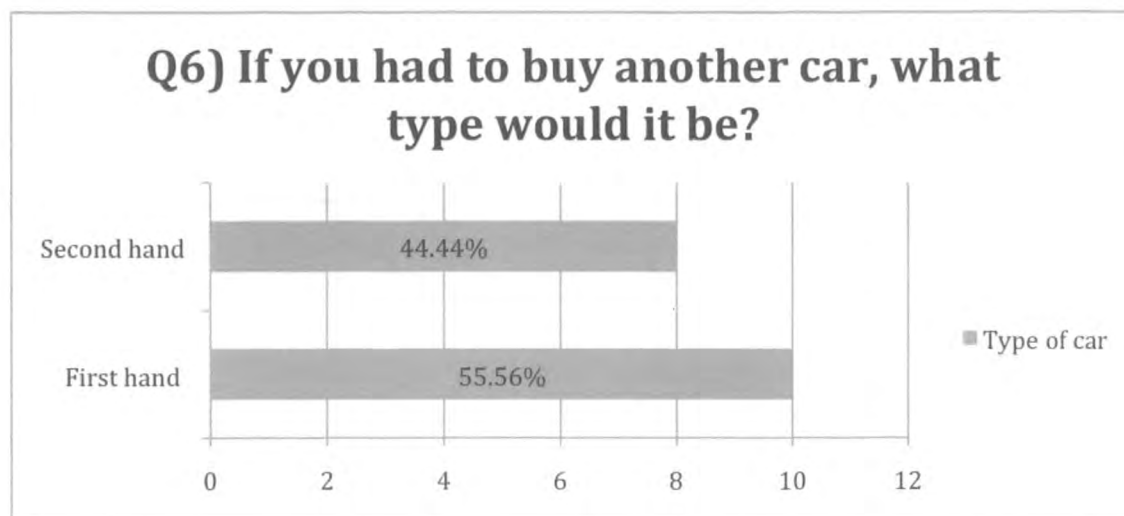


Fig 13 shows the results of the demand of the consumers in Singapore. It is the result of a questionnaire conducted to find the nature of demand of the consumer market for vehicles. It complements the data obtained from secondary resources. It shows *increasing demand for Used cars⁴¹ as compared to First hand cars, newly off the showroom.*

³⁸ <<http://www.asiaone.com/print/Motoring/News/Story/A1Story20110804-292654.html>>

Date accessed: 20th January 2012

³⁹ <<http://motoring.asiaone.com/Motoring/News/Story/A1Story20110804-292654/2.html>> Date accessed: 20th January 2012

⁴⁰ Appendix- Page 46

⁴¹ Second hand vehicles

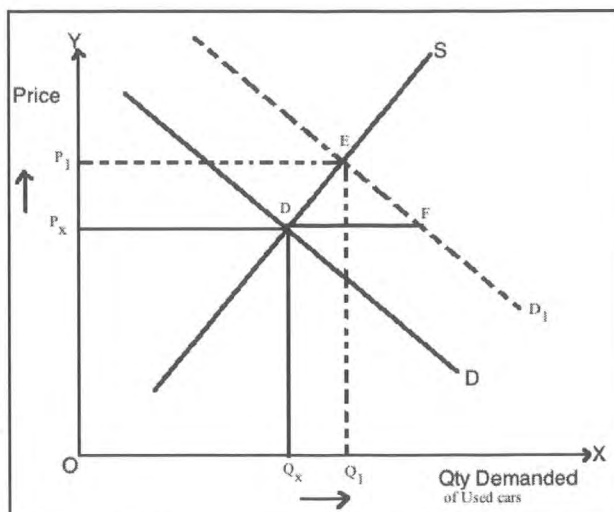
Fig 14: Demand for Used cars

Fig 14 shows the change in demand for Used cars assuming the prices of COE are rising. It is a diagrammatic representation of the above figures. With the increase in the demand for Used cars, its demand curve shifts to the right. With the shift in the position of the equilibrium, the new price and output comes to be fixed at OP_1 and OQ_1 .

Along with the demand by consumers, used cars also provide the government with a new source for its revenue. *Singapore Used Cars have a market of their own which is strong enough to contribute to Singapore Economy. They are not only supplied to the residents of Singapore, but are also exported to other countries. So, the Singapore Used Car Market has a strong export base⁴².*

In the first quarter of the year 2011, 15,441 cars changed owners – more than double the number of new cars sold⁴³.

Singapore's policy forces its citizens to give up their COE after a period of time during which the value of the car they own depreciates. *Motor vehicles more than ten years old must either renew the COE for either 5 or 10 years or de-register the vehicle for scrapping or exporting from Singapore, usually to neighboring countries. For vehicles, which have a renewed COE for 5 years, the owner of the vehicle has to scrap the vehicle at the end of the period with no option to renew the COE⁴⁴.*

⁴² <<http://finance.mapsofworld.com/economy/singapore/used-car.html>>

Data accessed: 30th October 2011

⁴³ <<http://cars.st701.com/resources/index.php?c=article&aid=13498&title=How-to-break-the-illusion-on-used-car-prices>> Date accessed: 20th January 2012

⁴⁴ <http://en.wikipedia.org/wiki/Certificate_of_Entitlement> Date accessed: 21st January 2012

hence, the cars that get deregistered are of fairly good quality. This quality ensures Singapore a secure position in the Used Car Market against its competitors. It is for this reason that the Singapore's economy relies heavily on its export revenue.

Over 60,000 Used cars were sold in the first 10 months of the year 2011. This is up to three times of the full-year sales generated between 2004 and 2009⁴⁵.

Buyers are driving second-hand cars ownership transfers and online car listings to the highest figure since 2000. Tight supply of certificates of entitlement (COEs) makes new cars too expensive in Singapore, which already has the world's highest cost of car ownership due to vehicle and ownership taxes⁴⁶.

As the COE prices continue to rise, the future demand for the Used cars can be forecasted for the years 2012 - 2016, by predicting the total number of future transfers for each category⁴⁷.

Table 10: Total transfers of first hand motor vehicles

| <u>Year</u> | <u>Total Transfers</u> |
|--------------------|-------------------------------|
| 2007 | 73,568 |
| 2008 | 77,778 |
| 2009 | 81,100 |
| 2010 | 105,315 |
| 2011 | 126,469 |

In Table 10, the number of transfers has increased from 2007 to 2011.

Table 11: Prediction of future total number of transfers for categories A, B and E from 2012-2016 [Appendix- Used Car model]

The equation for the projected transfers is:

$$y_{transfers} = 60248.60446 - 16.93888353x_1 + 1.117589762x_2 + 11.4424809x_3^{48}$$

⁴⁵ <http://www.asiaone.com/Motoring/News/Story/A1Story20111114-310554.html>

Date accessed: 13/02/12

⁴⁶ <http://www.mycarforum.com/index.php?showtopic=2674047>

Date accessed: 13/02/12

⁴⁷ The categories are segregated with accordance to the 5 categories of the COE.

⁴⁸ Appendix - Page 58

| Year | Prices of COE-Category A | Prices of COE-Category B | Prices of COE-Category E | Transfers |
|------|--------------------------|--------------------------|--------------------------|-----------|
| 2007 | 14814.6 | 16086.8 | 16496.7 | 23818 |
| 2008 | 12633.2 | 12941.0 | 14746.8 | 29459 |
| 2009 | 11298.7 | 12191.1 | 13241.6 | 34003 |
| 2010 | 29906.5 | 38969.8 | 40056.2 | 55560 |
| 2011 | 47872.8 | 58695.8 | 66165.3 | 72031 |
| 2012 | 45028.5 | 61034.7 | 67237.0 | 135085 |
| 2013 | 51682.2 | 79304.6 | 87596.6 | 275761 |
| 2014 | 62270.1 | 94172.0 | 107621.6 | 342165 |
| 2015 | 71453.8 | 103693.9 | 121449.3 | 355469 |
| 2016 | 76545.0 | 118367.2 | 135080.6 | 441604 |

Table 12: Prediction of future total number of transfers for category C from 2012-2016
[Appendix- Used Car model]

The equation for the projected transfers is:

$$y_{transfers} = 11896.24 + 0.153114x_1^{49}$$

| Year | Prices of COE-Category C | Transfer |
|------|--------------------------|----------|
| 2007 | 6666.4 | 14816 |
| 2008 | 13336.5 | 13948 |
| 2009 | 11896.1 | 13748 |
| 2010 | 29582.5 | 16107 |
| 2011 | 32074.8 | 17086 |
| 2012 | 38939.7 | 17858 |
| 2013 | 47197.2 | 19123 |
| 2014 | 54431.2 | 20230 |
| 2015 | 59792.2 | 21051 |
| 2016 | 68125.3 | 22327 |

Table 13: Prediction of future total number of transfers for category D from 2012-2016
[Appendix- Used Car model]

The equation for the projected transfers is:

$$y_{transfers} = 28600.83427 + 3.925276596x_1^{50}$$

| Year | Prices of COE- Category D | Transfers |
|------|------------------------------|-----------|
| 2007 | 1130.8 | 34553 |
| 2008 | 1279.9 | 34078 |
| 2009 | 917.8 | 32911 |
| 2010 | 1300.3 | 32213 |
| 2011 | 2145.1 | 37352 |
| 2012 | 1987.2 | 36401 |
| 2013 | 2290.7 | 37592 |
| 2014 | 2634.0 | 38940 |
| 2015 | 2964.1 | 40236 |
| 2016 | 3081.9 | 40698 |

From the above tables, the highlighted figures show the rising demand for the Used cars. As the government plans to further limit the supply of COE, the number of transfers per year will increase.

⁵⁰ Appendix – Page 59

Econometrics analysis to forecast the future prices of the Certificate of entitlement for the years 2012-2016

Using the secondary data collected from 2007 to 2011, simple linear regression was formed to find the future COE prices for its 5 different categories. As there are many bids in a year, the collated COE price for each year was found by taking the average of the 1st Open bidding exercise of each month.

Model 1: Simple Linear regression model (with two variables) – Category A (1600cc and below)

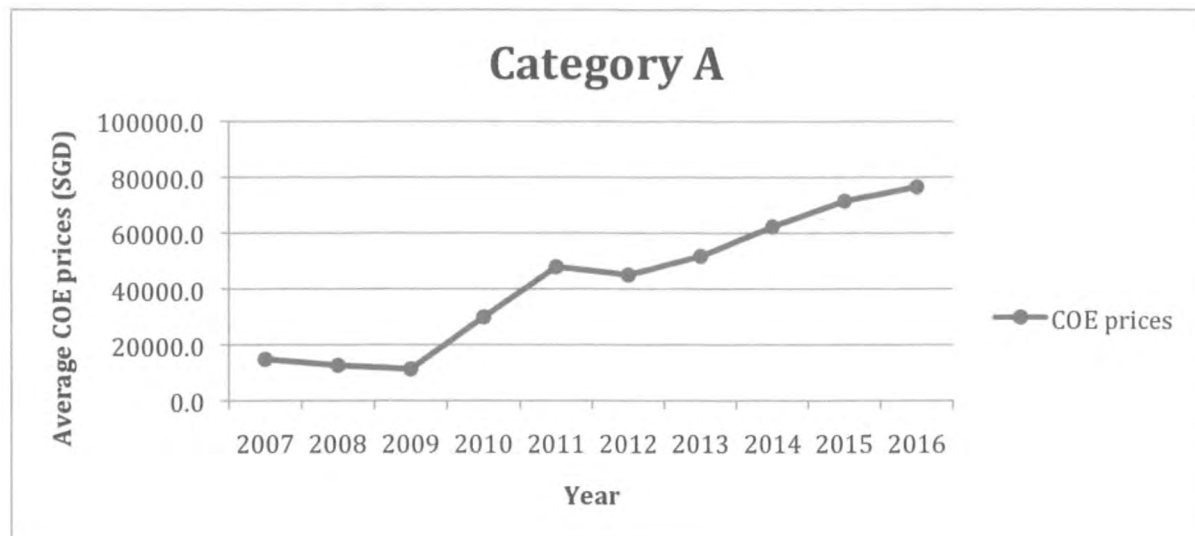
| | A | B | C | D | E | F | G | H |
|----|---|----------------|-------------------|-------------------|---------------|----------|---------|-------------------|
| 1 | Linear Regression | | | | | | | |
| 2 | | | | | | | | |
| 3 | Regression Statistics | | | | | | | |
| 4 | R | 0.83614 | | | | | | |
| 5 | R Square | 0.69914 | | | | | | |
| 6 | Adjusted R Square | 0.39828 | | | | | | |
| 7 | Standard Error | 12,124.91659 | | | | | | |
| 8 | Total Number Of Cases | 5 | | | | | | |
| 9 | COE prices = -132946.6056 - 2.1365 * Motor Vehicle population + 0.1840 * Total Population | | | | | | | |
| 10 | | | | | | | | |
| 11 | ANOVA | | | | | | | |
| 12 | | d.f. | SS | MS | F | p-level | | |
| 13 | Regression | 2 | 683,254,179.71147 | 341,627,089.85573 | 2.32378 | 0.30086 | | |
| 14 | Residual | 2 | 294,027,204.39672 | 147,013,602.19836 | | | | |
| 15 | Total | 4 | 977,281,384.10819 | | | | | |
| 16 | | | | | | | | |
| 17 | | Coefficients | Standard Error | LCL | UCL | t Stat | p-level | H0 (2%) rejected? |
| 18 | Intercept | -132,946.60564 | 149,765.75594 | -1,175,998.70971 | 910,105.49844 | -0.8877 | 0.46836 | No |
| 19 | Motor Vehicle population | -2.13649 | 1.93042 | -15.58102 | 11.30805 | -1.10675 | 0.3837 | No |
| 20 | Total Population | 0.18403 | 0.12521 | -0.68802 | 1.05607 | 1.46972 | 0.27942 | No |
| 21 | T (2%) | 6.96456 | | | | | | |
| 22 | LCL - Lower value of a reliable interval (LCL) | | | | | | | |
| 23 | UCL - Upper value of a reliable interval (UCL) | | | | | | | |

Justifying accuracy of Model 1:

In the above model, the R square value indicates the reliability of the model. It is 69.91% implying that the two independent variables, motor vehicle population and population of Singapore are moderately correlated.

The equation found goes by:

$$y = -132946.6056 - 2.1365x_{\text{Motor Vehicle Population}} + 0.1840x_{\text{Total Population}}$$

Fig 15: Average COE prices from 2007 to 2016

Model 2: Simple Linear regression model (with two variables) – Category B (1600cc above)

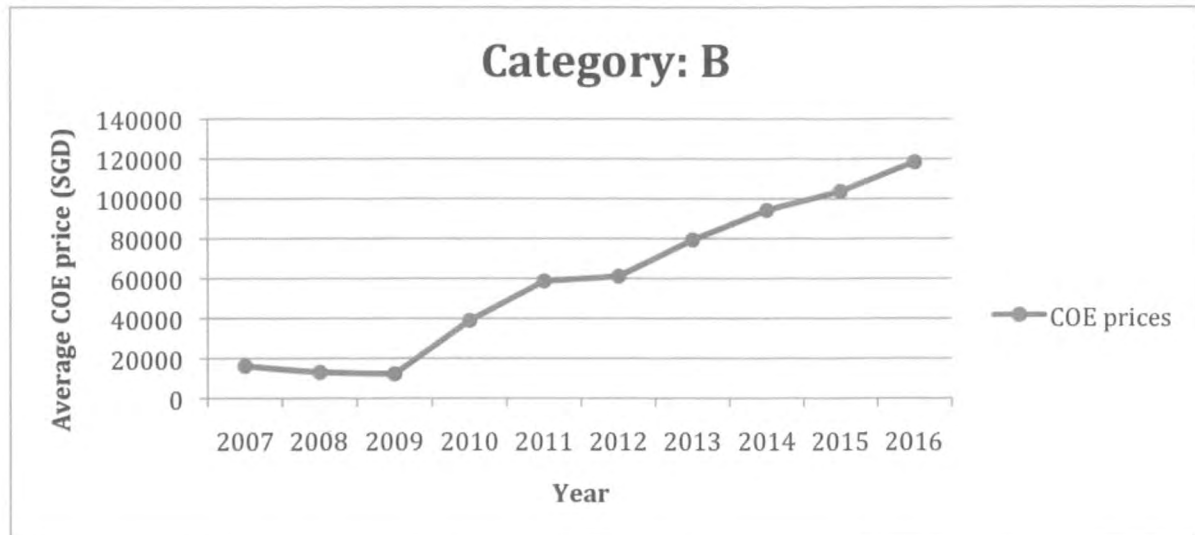
| | A | B | C | D | E | F | G | H |
|----|---|-----------------|---------------------|------------------|-----------------|----------|---------|-------------------|
| 1 | Linear Regression | | | | | | | |
| 2 | | | | | | | | |
| 3 | Regression Statistics | | | | | | | |
| 4 | R | 0.9745 | | | | | | |
| 5 | R Square | 0.94964 | | | | | | |
| 6 | Adjusted R Square | 0.89928 | | | | | | |
| 7 | Standard Error | 6,505.77372 | | | | | | |
| 8 | Total Number Of Cases | 5 | | | | | | |
| 9 | COE prices = 1151374.8337 + 6.1154 * Motor Vehicle population - 0.5271 * Total Population | | | | | | | |
| 10 | | | | | | | | |
| 11 | ANOVA | | | | | | | |
| 12 | | d.f. | SS | MS | F | p-level | | |
| 13 | Regression | 2. | 1,596,284,262.663 | 798,142,131.3315 | 18.85742 | 0.05036 | | |
| 14 | Residual | 2. | 84,650,183.31191 | 42,325,091.65596 | | | | |
| 15 | Total | 4. | 1,680,934,445.97491 | | | | | |
| 16 | | | | | | | | |
| 17 | | Coefficients | Standard Error | LCL | UCL | t Stat | p-level | H0 (2%) rejected? |
| 18 | Intercept | 1,151,374.83374 | 364,526.7188 | -1,387,392.18047 | 3,690,141.84796 | 3.15855 | 0.08731 | No |
| 19 | Motor Vehicle population | 6.11544 | 1.51451 | -4.43242 | 16.6633 | 4.03791 | 0.05621 | No |
| 20 | Total Population | -0.52714 | 0.14735 | -1.55336 | 0.49907 | -3.57753 | 0.07003 | No |
| 21 | T (2%) | 6.96456 | | | | | | |
| 22 | LCL - Lower value of a reliable interval (LCL) | | | | | | | |
| 23 | UCL - Upper value of a reliable interval (UCL) | | | | | | | |

Justifying accuracy of Model 2:

In the above model, the R square value indicates the reliability of the model. It is 94.96% implying that the two independent variables, motor vehicle population and population of Singapore are highly correlated. It also proves that for Category B, this model is very accurate.

The equation found goes by:

$$y = 1151374.8337 + 6.1154x_{\text{motor vehicle population}} - 0.5271x_{\text{population}}$$

Fig 16: Average COE prices from 2007 to 2016**Model 3: Simple Linear regression model (with two variables) – Category C (Goods)**

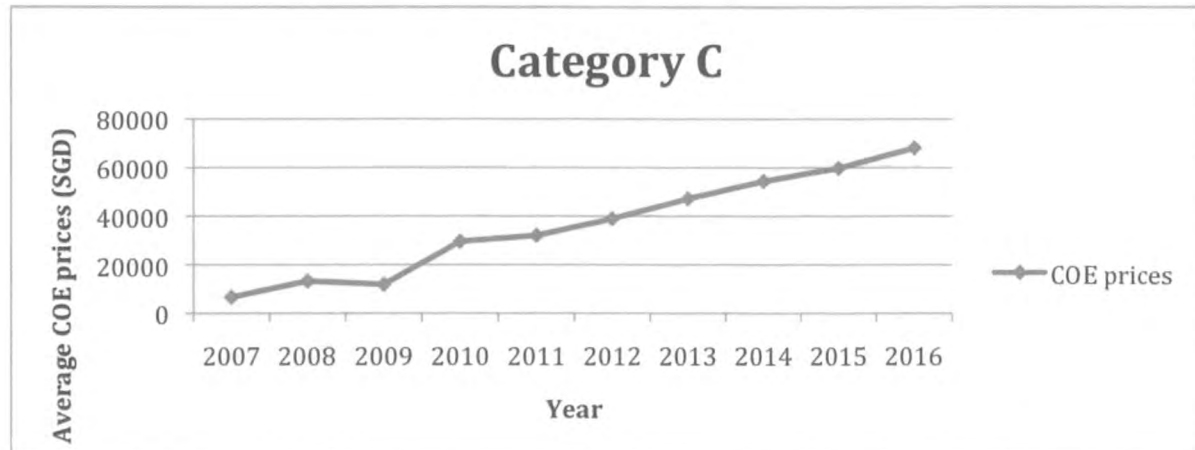
| | A | B | C | D | E | F | G | H |
|----|--|---------------|-------------------|-------------------|-----------------|----------|---------|-------------------|
| 1 | Linear Regression | | | | | | | |
| 2 | | | | | | | | |
| 3 | Regression Statistics | | | | | | | |
| 4 | R | 0.97827 | | | | | | |
| 5 | R Square | 0.95702 | | | | | | |
| 6 | Adjusted R Square | 0.91403 | | | | | | |
| 7 | Standard Error | 3,333.898 | | | | | | |
| 8 | Total Number Of Cases | 5 | | | | | | |
| 9 | COE prices = 249745.3033 - 5.2594 * Motor Vehicle population + 0.1156 * Total Population | | | | | | | |
| 10 | | | | | | | | |
| 11 | ANOVA | | | | | | | |
| 12 | | d.f. | SS | MS | F | p-level | | |
| 13 | Regression | 2 | 494,949,901.35504 | 247,474,950.67752 | 22.2652 | 0.04298 | | |
| 14 | Residual | 2 | 22,229,751.70732 | 11,114,875.85366 | | | | |
| 15 | Total | 4 | 517,179,653.06236 | | | | | |
| 16 | | | | | | | | |
| 17 | | Coefficients | Standard Error | LCL | UCL | t Stat | p-level | H0 (2%) rejected? |
| 18 | Intercept | 249,745.30333 | 152,039.82054 | -809,144.65273 | 1,308,635.25938 | 1.64263 | 0.24217 | No |
| 19 | Motor Vehicle population | -5.25938 | 1.75408 | -17.47575 | 6.95699 | -2.99838 | 0.09556 | No |
| 20 | Total Population | 0.11558 | 0.02526 | -0.06035 | 0.29151 | 4.57554 | 0.04459 | No |
| 21 | T (2%) | 6.96456 | | | | | | |
| 22 | LCL - Lower value of a reliable interval (LCL) | | | | | | | |
| 23 | UCL - Upper value of a reliable interval (UCL) | | | | | | | |

Justifying accuracy of Model 3:

In the above model, the R square value indicates the reliability of the model. It is 95.70% implying that the two independent variables, motor vehicle population and population of Singapore are highly correlated. It also proves that for Category C, this model is very accurate.

The equation found goes by:

$$y = 249745.3033 - 5.2594_{\text{Motor Vehicle population}} + 0.1156_{\text{Population}}$$

Fig 17: Average COE prices from 2007 to 2016

Model 4: Simple Linear regression model (with two variables) – Category D (Motorcycles)

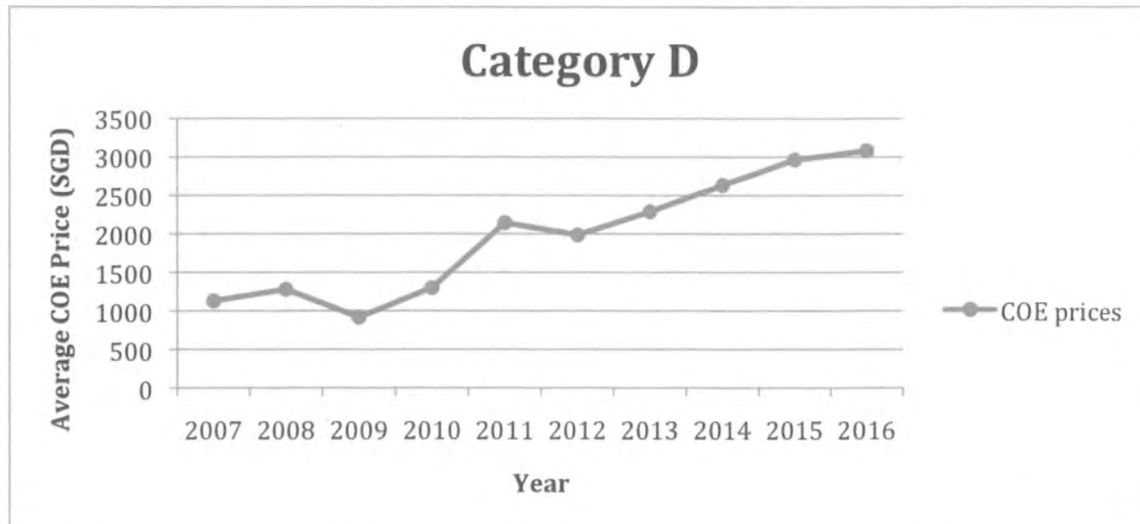
| | A | B | C | D | E | F | G | H |
|----|---|--------------|----------------|---------------|---------------|----------|---------|-------------------|
| 1 | Linear Regression | | | | | | | |
| 2 | | | | | | | | |
| 3 | Regression Statistics | | | | | | | |
| 4 | R | 0.91968 | | | | | | |
| 5 | R Square | 0.84581 | | | | | | |
| 6 | Adjusted R Square | 0.69163 | | | | | | |
| 7 | Standard Error | 259.61029 | | | | | | |
| 8 | Total Number Of Cases | 5 | | | | | | |
| 9 | COE prices = 44516.6401 - 0.4044 * Motor Vehicle population + 0.0032 * Total Population | | | | | | | |
| 10 | | | | | | | | |
| 11 | ANOVA | | | | | | | |
| 12 | | d.f. | SS | MS | F | p-level | | |
| 13 | Regression | 2 | 739,436.88674 | 369,718.44337 | 5.48564 | 0.15419 | | |
| 14 | Residual | 2 | 134,795.00623 | 67,397.50312 | | | | |
| 15 | Total | 4 | 874,231.89298 | | | | | |
| 16 | | | | | | | | |
| 17 | | Coefficients | Standard Error | LCL | UCL | t Stat | p-level | H0 (2%) rejected? |
| 18 | Intercept | 44,516.64013 | 19,230.86737 | -89,417.82672 | 178,451.10699 | 2.31485 | 0.14665 | No |
| 19 | Motor Vehicle population | -0.40443 | 0.15724 | -1.49954 | 0.69068 | -2.57204 | 0.12373 | No |
| 20 | Total Population | 0.00319 | 0.00097 | -0.00353 | 0.00992 | 3.30614 | 0.08058 | No |
| 21 | T (2%) | 6.96456 | | | | | | |
| 22 | LCL - Lower value of a reliable interval (LCL) | | | | | | | |
| 23 | UCL - Upper value of a reliable interval (UCL) | | | | | | | |

Justifying accuracy of Model 4:

In the above model, the R square value indicates the reliability of the model. It is 84.58% implying that the two independent variables, motor vehicle population and population of Singapore are highly correlated. It also proves that for Category D, this model is very accurate.

The equation found goes by:

$$y = 44516.6401 - 0.4044x_{\text{Motor vehicle population}} + 0.0032x_{\text{Population}}$$

Fig 18: Average COE prices from 2007 to 2016**Model 5: Simple Linear regression model (with two variables) – Category E (Other)**

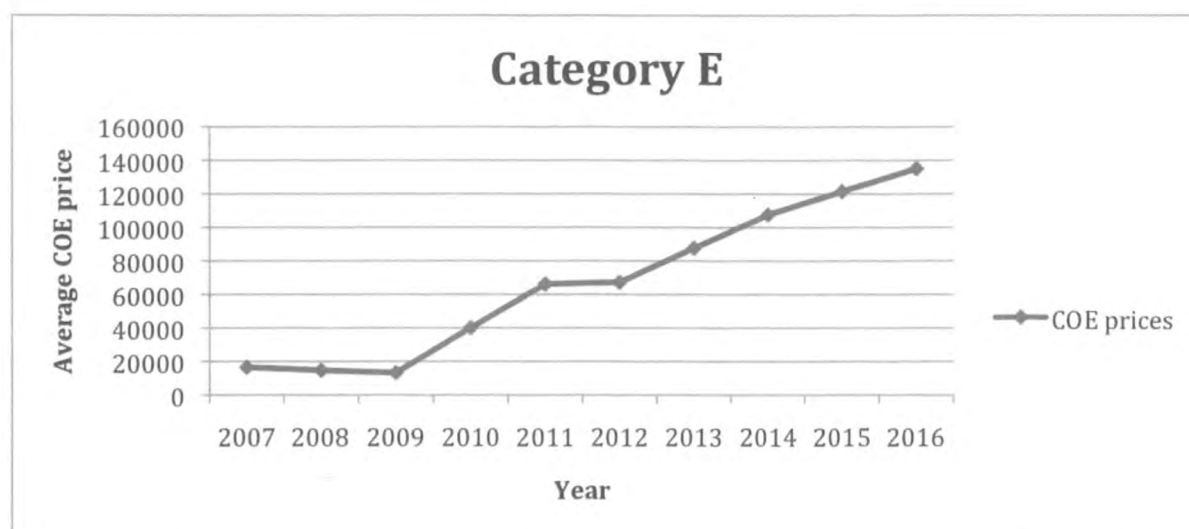
| | A | B | C | D | E | F | G | H |
|----|--|----------------|---------------------|---------------------|----------------|-----------|---------|-------------------|
| 1 | Linear Regression | | | | | | | |
| 2 | | | | | | | | |
| 3 | Regression Statistics | | | | | | | |
| 4 | R | 0.99886 | | | | | | |
| 5 | R Square | 0.99773 | | | | | | |
| 6 | Adjusted R Square | 0.99545 | | | | | | |
| 7 | Standard Error | 1,547.32169 | | | | | | |
| 8 | Total Number Of Cases | 5 | | | | | | |
| 9 | COE prices =- 327710.2885 + 64.8897 * Motor Vehicle population - 0.2331 * Total Population | | | | | | | |
| 10 | | | | | | | | |
| 11 | ANOVA | | | | | | | |
| 12 | | d.f. | SS | MS | F | p-level | | |
| 13 | Regression | 2 | 2,100,015,759.37221 | 1,050,007,879.68611 | 438.56233 | 0.00227 | | |
| 14 | Residual | 2 | 4,788,408.85009 | 2,394,204.42505 | | | | |
| 15 | Total | 4 | 2,104,804,168.22231 | | | | | |
| 16 | | | | | | | | |
| 17 | | Coefficients | Standard Error | LCL | UCL | t Stat | p-level | H0 (2%) rejected? |
| 18 | Intercept | -327,710.28851 | 16,532.08233 | -442,848.91384 | -212,571.66319 | -19.82269 | 0.00254 | Yes |
| 19 | Motor Vehicle population | 64.88967 | 3.25471 | 42.22209 | 87.55725 | 19.93719 | 0.00251 | Yes |
| 20 | Total Population | -0.23305 | 0.01573 | -0.34258 | -0.12352 | -14.81924 | 0.00452 | Yes |
| 21 | T (2%) | 6.96456 | | | | | | |
| 22 | LCL - Lower value of a reliable interval (LCL) | | | | | | | |
| 23 | UCL - Upper value of a reliable interval (UCL) | | | | | | | |

Justifying accuracy of Model 5:

In the above model, the R square value indicates the reliability of the model. It is 99.77% implying that the two independent variables, motor vehicle population and population of Singapore are highly correlated. It also proves that for Category E, this model seems to be precisely accurate.

The equation found goes by:

$$y = 327710.2885 + 64.8897x_{\text{Motor vehicle population}} - 0.2331x_{\text{Population}}$$

Fig 19: Average COE prices from 2007 to 2016**Evaluation of Model 1, 2, 3, 4 and 5**

| Categories/Year | Category A | Category B | Category C | Category D | Category E |
|-----------------|------------|------------|------------|------------|------------|
| 2007 | 14814.6 | 16086.8 | 6666.4 | 1130.8 | 16496.7 |
| 2008 | 12633.2 | 12941.0 | 13336.5 | 1279.9 | 14746.8 |
| 2009 | 11298.7 | 12191.1 | 11896.1 | 917.8 | 13241.6 |
| 2010 | 29906.5 | 38969.8 | 29582.5 | 1300.3 | 40056.2 |
| 2011 | 47872.8 | 58695.8 | 32074.8 | 2145.1 | 66165.3 |
| 2012 | 45028.5 | 61034.7 | 38939.7 | 1987.2 | 67237.0 |
| 2013 | 51682.2 | 79304.6 | 47197.2 | 2290.7 | 87596.6 |
| 2014 | 62270.1 | 94172.0 | 54431.2 | 2634.0 | 107621.6 |
| 2015 | 71453.8 | 103693.9 | 59792.2 | 2964.1 | 121449.3 |
| 2016 | 76545.0 | 118367.2 | 68125.3 | 3081.9 | 135080.6 |

All the categories show a similar trend in the movement of their future prices. In all models, there is a slight decrease in the price in 2012 as the momentum slows down. But over the next four years, the prices continue to rise steadily as the demand for vehicles is inelastic.

Analysis of Model 1,2,3,4 and 5:**Table 14: Average COE Prices**

| <u>Category</u> | <u>Average COE price (SGD)</u> |
|------------------------|---------------------------------------|
| A | 61395.91955 |
| B | 91314.47293 |
| C | 53697.11488 |
| D | 2591.575841 |
| E | 103797.0378 |

Models 2, 3 and 5 chart the upward movement of the price at a very fast rate after a slight rise in 2012. This could be a result of the government's plan on future cuts in the COE quotas.

It is found that the relation between the supply of motor vehicles, the total population of Singapore and COE prices are proportional in models 1 and 4. As the two variables increase, the price rises with the exception of the year 2012 where there is a slight dip in the price level. This will be due to a relatively bleak economic outlook for Singapore in 2012. Model 4 charts the prices of goods that can also be giffen goods as stated above. As the prices rise, its demand will also increase in terms of COE.

Strengths:

- Two variables have been taken into account for each of the five categories giving more accurate trends.
- The five models support the data in answering the research question as they predict the future COE prices given the demand for cars is inelastic.

Forecasting Government's future revenue from the sale of New cars (Model 6):

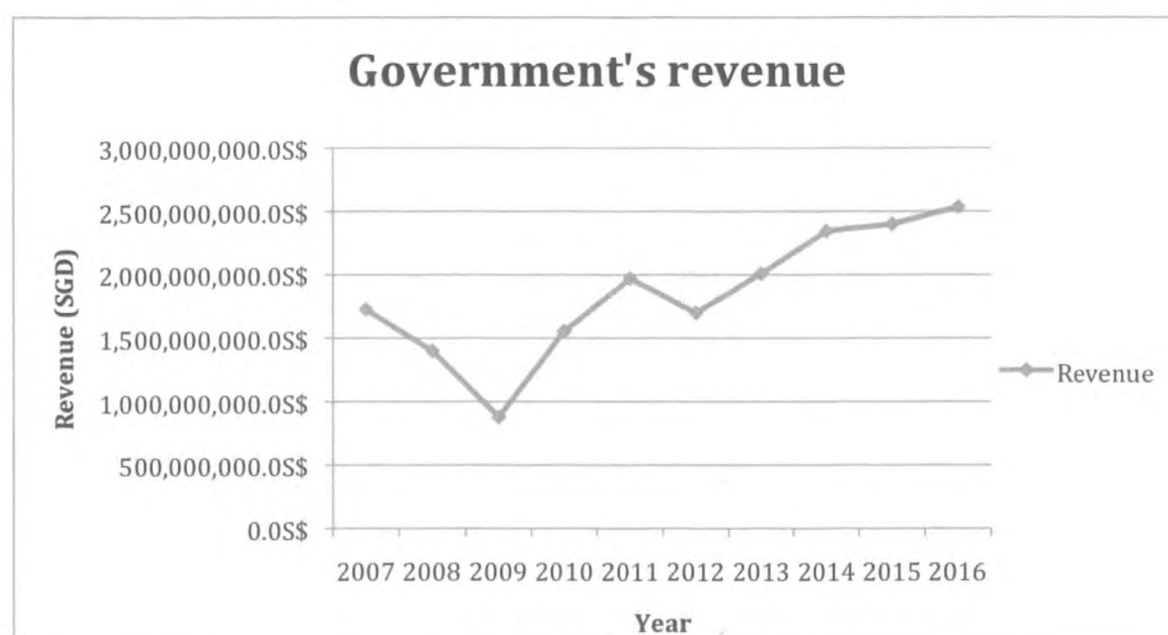
Using data from secondary resources and government published websites, the revenue collected from the COE Bidding system can be calculated from a simple formula:

$$\text{Revenue} = \text{COE Quota Premium} \times \text{Number of Successful bids}$$

Table 15: Projected Revenue for the year 2007 - 2016

| <u>Year</u> | <u>Revenue (SGD)</u> |
|-------------|----------------------|
| 2007 | 1,725,919,893.0 |
| 2008 | 1,398,205,824.0 |
| 2009 | 878,493,148.0 |
| 2010 | 1,553,962,168.0 |
| 2011 | 1,970,391,175.0 |
| 2012 | 1,698,804,114.0 |
| 2013 | 2,007,899,667.9 |
| 2014 | 2,343,006,550.3 |
| 2015 | 2,399,491,912.3 |
| 2016 | 2,534,639,857.2 |

Fig 20: Government's projected revenue over 5 years from COE



Analysis of Model 6:

In the above model, the revenue projected shows a clear dip in the years 2009 and 2012. The sales of cars fell in 2009 as a result of recession. *A shrinking market, coupled with the global economic crisis, mainly affected*⁵¹ the number of bids resulting in the dip. The COE prices for each category also show a fall in the prices in 2012 due to a relatively bleak economic outlook and stabilizing COE premiums. However, from then onwards, the revenue seems to rise onwards reaching as high as SGD 2,534,639,857.

⁵¹< <http://www.asiaone.com/Motoring/News/Story/A1Story20100107-190360.html>>
Date accessed: 28th January 2012

Conclusion

From the five models above, the quota premium for the five COE categories is predicted to rise consecutively over the next five years. This will significantly affect Singapore's economy. As the CPI inflation is already high at 5.7%⁵² in December 2011, the steady rise in COE prices will keep it stagnant at this high rate unless government intervenes.

The calculated elasticity for each category differs with the COE premium quota per month (as it is only calculated for the 1st open bid of every month). Taking the results of the latest tender, Category A and B are highly inelastic in nature. Hence, with the given increase in prices in these categories, the percentage change in the quantity demanded will be not be large. Consumers will prefer to wait for COE prices to fall into a reasonable range before they decide to buying New cars or sell their own cars in the Used car market for a couple of years.

The revenue received by the government will increase with the increasing prices if there is no significant change in demand. As it doesn't, the revenue will rise but not at a steady pace. The sales of used cars will increase the scope of the revenue of the government, as its demand will rise as a result of the rise in COE prices of relatively new cars. However, its full impact cannot be determined as its supply fluctuates in different time periods as the government predefines the number of quotas released every six months in a year.

In conclusion, the rising prices will affect the demand for vehicles by the consumers in the coming years. The extent of the effect varies in all five categories. The reduction in demand will change only by a small percentage in categories A and B compared to the exceptions of demand categories C, D and E.

✓ H=2

⁵² <<http://www.tradingeconomics.com/singapore/inflation-cpi>>
Date accessed: 23rd January 2012

Limitations

The econometrics models have been created based on the published historical data from various government websites. These figures may have been affected by other factors such as inflation. The models do not account for such changes. The COE premium prices used to predict these models are average of the 1st Open bidding exercise of each month for 5 years. This was done to simplify the process, as there were too many prices to form a general trend. The statistical data used to calculate projected revenue doesn't include the additional revenue from the sales of cars. It only shows the revenue from the sales of COEs to the respective vehicle owners. The primary data was collected from a section of people in the society. Their responses were assumed to represent the demand of the society. I could have collected responses from a larger sample of people, which may have given more accurate results.

Suggested policies:

The government should increase the supply of COE premiums. With the increase in supply, the prices quoted by the bidders will decrease, as there will be more premiums to bid for. However, the government plans to keep the premium quota reduced in the near future.

Appendix:

I. Questionnaire:

Please answer the following questions by ticking the following options. (You may tick more than one relevant option per question):

1. Which model of a car would you prefer?

☐ European (BMW, Mercedes Benz, Jaguar, Audi)

☐ Japanese cars (Toyota, Honda, Mitsubishi, Nissan)

☐ Korean (Kia, Hyundai, Daewoo)

☐ Chinese (Geely)

2. What is the number of cars do you possess?

☐ None

☐ 1

☐ 2

If more, please specify: _____

3. What is your annual salary income? Please select the range from below:

☐ SGD 0-100,000

☐ SGD 100,000-200,000

☐ SGD 200,000-300,000

☐ Above SGD 300,000

4. Would you buy a car with the rising COE (Certificate of Entitlement) prices?

☐ Yes

☐ No

5. If the prices increase drastically over the coming few years, will you sell your car?



☐ Yes

☐ No

6. If you had to buy another car, what type would it be?

☐ First-hand Car

☐ Second-hand Car

7. What is the maximum amount you are willing to quote for COE?

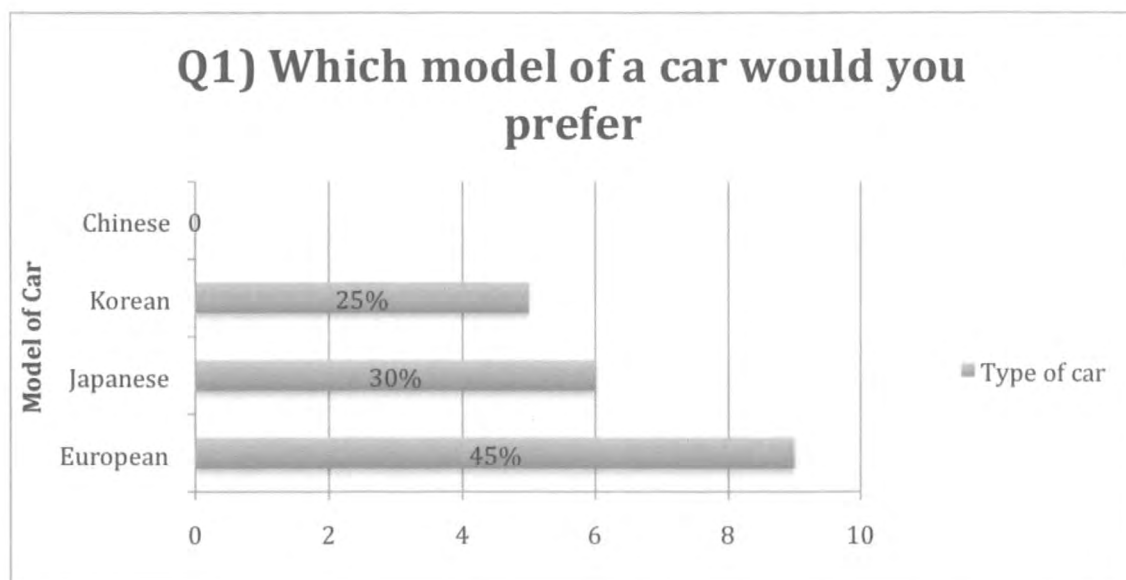
SGD _____

8. What kind of a car do you drive?

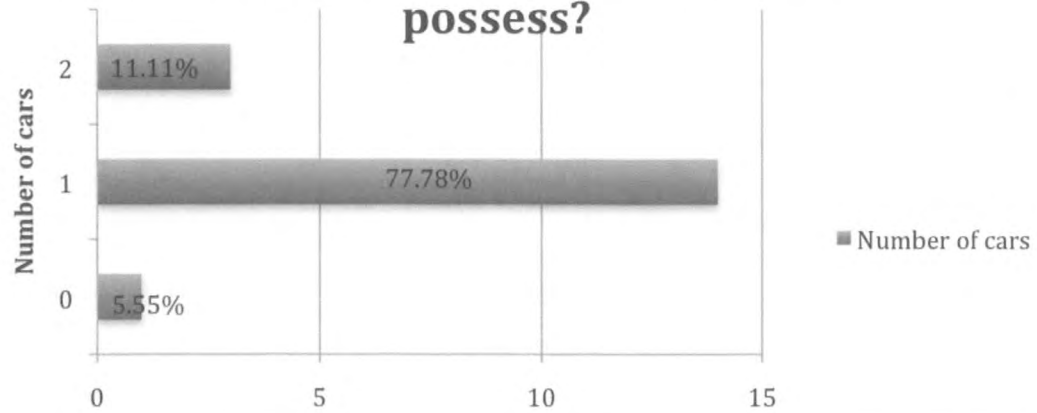
☐ Weekend Car

☐ Regular Car

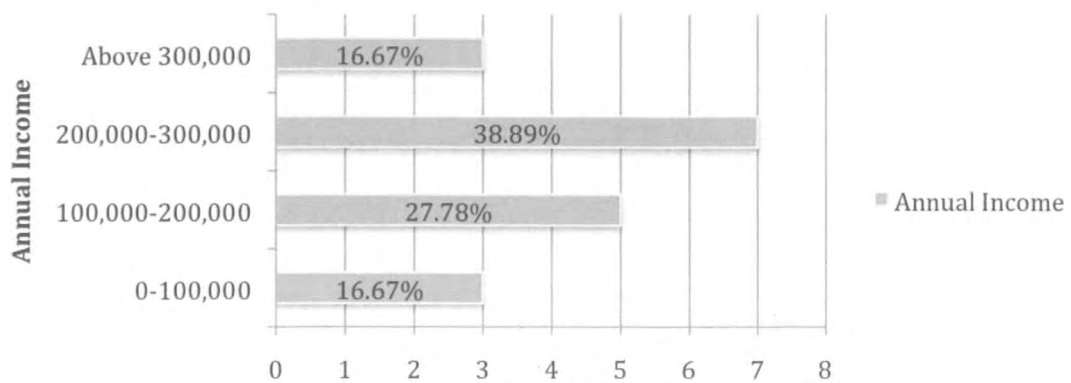
II. Questionnaire Results



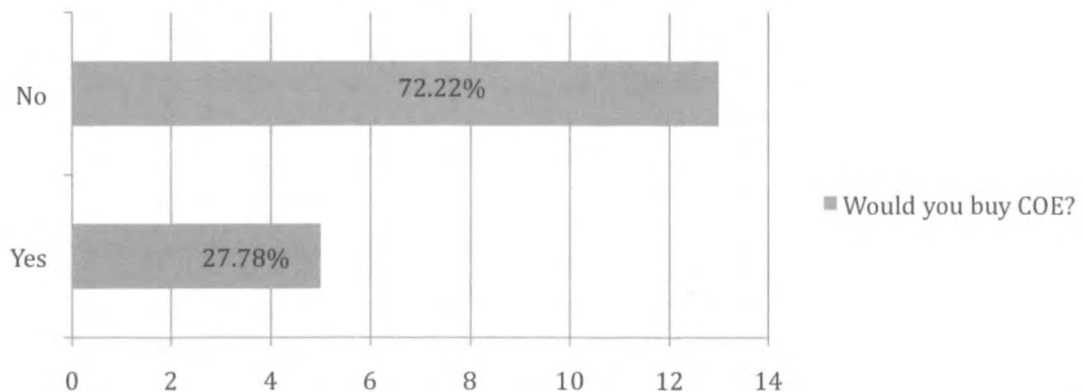
Q2) What number of cars do you possess?



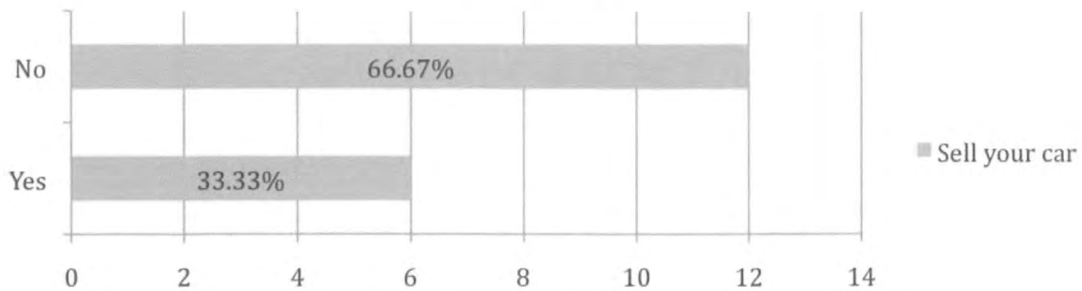
Q3) What is your annual salary income?



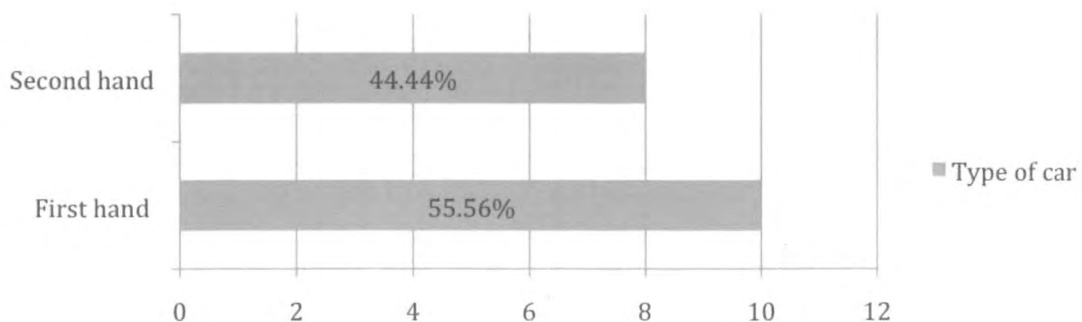
Q4) Would you buy a car with the rising COE (Certificate of Entitlement) prices?



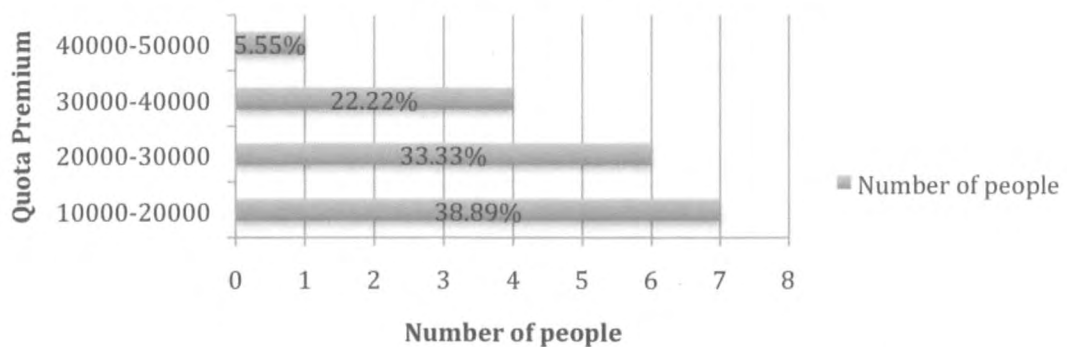
Q5) If the prices increase drastically over the coming few years, will you sell your car?

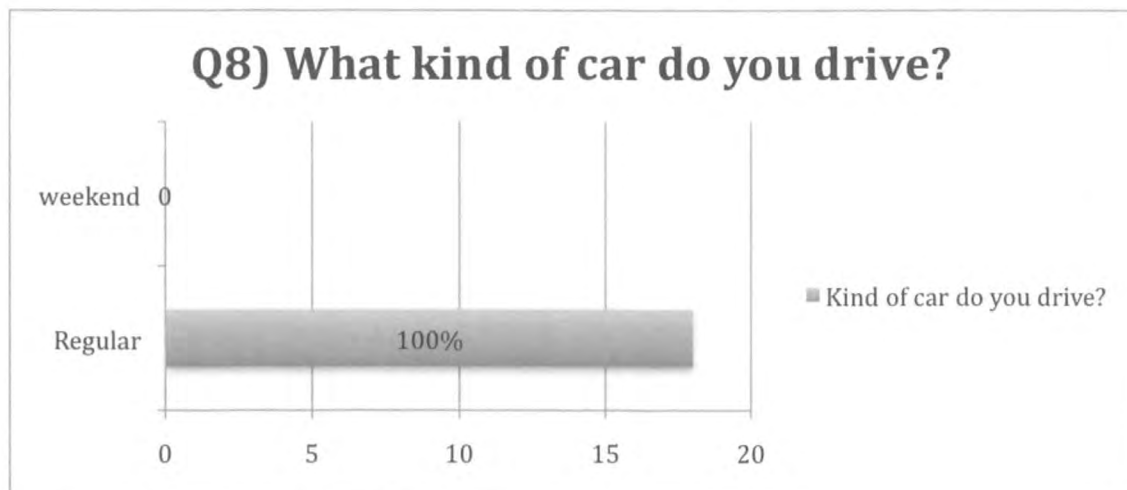


Q6) If you had to buy another car, what type would it be?



Q7) What is the maximum amount you are willing to quote for COE?





III. Calculated elasticity of 5 categories

Category A: 1600cc and below

| Year | Quota | Quota Premium | Total Bids Received | Number of Successful Bids |
|------------|-------|---------------|---------------------|---------------------------|
| April 2010 | 706 | \$30,000 | 1,242 | 704 |
| April 2011 | 565 | \$44,000 | 964 | 552 |

% change quantity demanded

$$= \frac{Q_1 - Q_0}{Q_0}$$

$$= \frac{552 - 704}{704}$$

$$= -0.2159$$

% change in price

$$= \frac{P_1 - P_0}{P_0}$$

$$= \frac{44000 - 30000}{30000}$$

$$= 0.4667$$

$$\therefore PED$$

$$= \frac{-0.2159}{0.4667}$$

$$= -0.46$$

Category B: Below 1600cc

| Year | Quota | Quota Premium | Total Bids Received | Number of Successful Bids |
|------------|-------|---------------|---------------------|---------------------------|
| April 2010 | 561 | \$40,001 | 896 | 549 |
| April 2011 | 423 | \$56,801 | 627 | 422 |

% change quantity demanded

$$= \frac{Q_1 - Q_0}{Q_0}$$

$$= \frac{422 - 549}{549}$$

$$= -0.2313$$

% change in price

$$= \frac{P_1 - P_0}{P_0}$$

$$= \frac{56801 - 40001}{40001}$$

$$= 0.4199$$

$$\therefore PED$$

$$= \frac{-0.2313}{0.4199}$$

$$= -0.55$$

Category C: Bus and Goods vehicle

| Year | Quota | Quota Premium | Total Bids Received | Number of Successful Bids |
|------------|-------|---------------|---------------------|---------------------------|
| April 2010 | 203 | \$35,556 | 298 | 203 |
| April 2011 | 277 | \$23,900 | 346 | 269 |

% change quantity demanded

$$\begin{aligned}
 &= \frac{Q_1 - Q_0}{Q_0} \\
 &= \frac{269 - 203}{203} \\
 &= 0.3251
 \end{aligned}$$

% change in price

$$\begin{aligned}
 &= \frac{P_1 - P_0}{P_0} \\
 &= \frac{23900 - 35556}{35556} \\
 &= -0.3278
 \end{aligned}$$

 $\therefore PED$

$$\begin{aligned}
 &= \frac{-0.3251}{0.3278} \\
 &= -0.99
 \end{aligned}$$

Category D: Motorcycles

| Year | Quota | Quota Premium | Total Bids Received | Number of Successful Bids |
|------------|-------|---------------|---------------------|---------------------------|
| April 2010 | 339 | \$1,253 | 383 | 311 |
| April 2011 | 326 | \$2,502 | 478 | 326 |

% change quantity demanded

$$\begin{aligned}
 &= \frac{Q_1 - Q_0}{Q_0} \\
 &= \frac{478 - 383}{383} \\
 &= 0.2480
 \end{aligned}$$

% change in price

$$\begin{aligned}
 &= \frac{P_1 - P_0}{P_0} \\
 &= \frac{326 - 311}{311} \\
 &= 0.9968
 \end{aligned}$$

$$\therefore PED$$

$$= \frac{0.2480}{0.9968}$$

$$= 0.25$$

Category E: Open

| Year | Quota | Quota Premium | Total Bids Received | Number of Successful Bids |
|------------|-------|---------------|---------------------|---------------------------|
| April 2010 | 390 | \$43,003 | 709 | 383 |
| April 2011 | 330 | \$56,001 | 484 | 329 |

% change quantity demanded

$$= \frac{Q_1 - Q_0}{Q_0}$$

$$= \frac{329 - 383}{383}$$

$$= -0.1409$$

% change in price

$$= \frac{P_1 - P_0}{P_0}$$

$$= \frac{56001 - 43003}{43003}$$

$$= 0.3023$$

$\therefore PED$

$$= \frac{-0.1409}{0.3023}$$

$$= -0.47$$

For the second month:

(ii) **August**

Category A: 1600cc and below

| Year | Quota | Quota Premium | Total Bids Received | Number of Successful Bids |
|-------------|-------|---------------|---------------------|---------------------------|
| August 2010 | 606 | \$29,000 | 975 | 606 |
| August 2011 | 557 | \$49,301 | 927 | 557 |

% change quantity demanded

$$= \frac{Q_1 - Q_0}{Q_0}$$

$$= \frac{557 - 606}{606}$$

$$= -0.0809$$

% change in price

$$= \frac{P_1 - P_0}{P_0}$$

$$= \frac{49301 - 29000}{29000}$$

$$= 0.7000$$

$\therefore PED$

$$= \frac{-0.0809}{0.7}$$

= -0.12

Category B: Below 1600cc

| Year | Quota | Quota Premium | Total Bids Received | Number of Successful Bids |
|-------------|-------|---------------|---------------------|---------------------------|
| August 2010 | 482 | \$42,810 | 683 | 472 |
| August 2011 | 353 | \$65,521 | 527 | 353 |

% change quantity demanded

$$= \frac{Q_1 - Q_0}{Q_0}$$

$$= \frac{353 - 472}{472}$$

$$= -0.2521$$

% change in price

$$= \frac{P_1 - P_0}{P_0}$$

$$= \frac{65521 - 42810}{42810}$$

$$= 0.5305$$

$$\therefore PED$$

$$= \frac{-0.2521}{0.5305}$$

$$= -0.48$$

Category C: Goods vehicles and buses

| Year | Quota | Quota Premium | Total Bids Received | Number of Successful Bids |
|-------------|-------|---------------|---------------------|---------------------------|
| August 2010 | 206 | \$30,002 | 275 | 205 |
| August 2011 | 245 | \$32,289 | 367 | 237 |

% change quantity demanded

$$= \frac{Q_1 - Q_0}{Q_0}$$

$$= \frac{237 - 205}{205}$$

$$= 0.1561$$

% change in price

$$= \frac{P_1 - P_0}{P_0}$$

$$= \frac{32289 - 30002}{30002}$$

$$= 0.0762$$

$\therefore PED$

$$= \frac{0.1561}{0.0762}$$

$$= 2.05$$

Category D: Motorcycles

| Year | Quota | Quota Premium | Total Bids Received | Number of Successful Bids |
|-------------|-------|---------------|---------------------|---------------------------|
| August 2010 | 335 | \$1,251 | 369 | 330 |
| August 2011 | 387 | \$1,999 | 471 | 382 |

% change quantity demanded

$$= \frac{Q_1 - Q_0}{Q_0}$$

$$\begin{aligned}
 &= \frac{382 - 330}{330} \\
 &= 0.1576 \\
 &\text{\% change in price} \\
 &= \frac{P_1 - P_0}{P_0} \\
 &= \frac{1999 - 1251}{1251} \\
 &= 0.5979
 \end{aligned}$$

$\therefore PED$

$$= \frac{0.1576}{0.5979}$$

$$= 0.26$$

Category E: Open

| Year | Quota | Quota Premium | Total Bids Received | Number of Successful Bids |
|-------------|-------|---------------|---------------------|---------------------------|
| August 2010 | 315 | \$43,501 | 583 | 315 |
| August 2011 | 337 | \$67,000 | 516 | 335 |

% change quantity demanded

$$\begin{aligned}
 &= \frac{Q_1 - Q_0}{Q_0} \\
 &= \frac{335 - 315}{315} \\
 &= 0.0635
 \end{aligned}$$

% change in price

$$\begin{aligned}
 &= \frac{P_1 - P_0}{P_0} \\
 &= \frac{67000 - 43501}{43501} \\
 &= 0.5402
 \end{aligned}$$

$\therefore PED$

$$= \frac{0.0635}{0.5402}$$

$$= 0.12$$

IV. Econometrics Software

1. Microsoft Office Excel 2008

Microsoft Excel has the basic features of all spreadsheets using a grid of *cells* arranged in numbered *rows* and letter named *columns* to organize data manipulations like arithmetic operations. It has a battery of supplied functions to answer statistical, engineering and financial needs. In addition, it can display data as line graphs, histograms and charts, and with a very limited three-dimensional graphical display. It allows sectioning of data to view its dependencies on various factors from different perspectives (using pivot tables and the scenario manager). It, also, has a programming aspect, *Visual Basic for Applications*, allowing the user to employ a wide variety of numerical methods, for example, for solving differential equations of mathematical physics, and then reporting the results back to the spreadsheet⁵³.

V. Econometrics Model

Model 1:

The first model projects the future COE prices for Category A which includes cars 1600 cc and above for the years 2012 to 2016.

$$y = -132946.6056 - 2.1365x_1 + 0.1840x_2$$

y is the future COE prices

x_1 is the total motor vehicle population

x_2 is the total population

| <u>Year</u> | <u>Motor Vehicle population</u> | <u>Total Population</u> | <u>COE prices</u> |
|-------------|---------------------------------|-------------------------|-------------------|
| 2012 | 378545.2 | 5362700.8 | 45028.5 |
| 2013 | 384031.1 | 5462560.9 | 51682.2 |
| 2014 | 389671.6 | 5585598.9 | 62270.1 |
| 2015 | 397258.1 | 5723599.4 | 71453.8 |
| 2016 | 406167.6 | 5854720.8 | 76545.0 |

Model 2:

The second model projects the future COE prices for Category B which includes cars below 1600 cc for the years 2012 to 2016.

⁵³ < http://en.wikipedia.org/wiki/Microsoft_Excel#Basic_operation > Date accessed: 22nd January 2012

$$y = 1151374.8337 + 6.1154x_1 - 0.5271x_2$$

y is the future COE prices

x_1 is the total motor vehicle population

x_2 is the total population

| Year | <u>Motor Vehicle population</u> | <u>Total Population</u> | <u>COE prices</u> |
|-------------|--|------------------------------------|--------------------------|
| 2012 | 283929 | 5362700.75 | 61034.7 |
| 2013 | 295523.7 | 5462560.9 | 79304.6 |
| 2014 | 308559.8 | 5585598.9 | 94172.0 |
| 2015 | 322011.4 | 5723599.4 | 103693.9 |
| 2016 | 335712.4 | 5854720.8 | 118367.2 |

Model 3:

The third model projects the future COE prices for Category C which includes goods trucks and buses for the years 2012 to 2016.

$$y = 24975.3033 - 5.2594x_1 + 0.1156x_2$$

y is the future COE prices

x_1 is the total motor vehicle population

x_2 is the total population

| Year | <u>Motor Vehicle population</u> | <u>Total Population</u> | <u>COE prices</u> |
|-------------|--|--------------------------------|--------------------------|
| 2012 | 157952.2 | 5362700.75 | 38939.70932 |
| 2013 | 158577.06 | 5462560.87 | 47197.15051 |
| 2014 | 159905.948 | 5585598.901 | 54431.19334 |
| 2015 | 161919.8284 | 5723599.356 | 59792.24334 |
| 2016 | 163217.4287 | 5854720.754 | 68125.27787 |

Model 4:

The fourth model projects the future COE prices for Category D which includes motorcycles for the years 2012 to 2016.

$$y = 44516.6401 - 0.4044x_1 + 0.0032x_2$$

y is the future COE prices

x_1 is the total motor vehicle population

x_2 is the total population

| <u>Year</u> | <u>Motor Vehicle population</u> | <u>Total Population</u> | <u>COE prices</u> |
|-------------|---------------------------------|-------------------------|-------------------|
| 2012 | 147601.7 | 5362700.75 | 1987.15502 |
| 2013 | 147641.26 | 5462560.87 | 2290.70934 |
| 2014 | 147765.958 | 5585598.901 | 2634.003168 |
| 2015 | 148041.6364 | 5723599.356 | 2964.120278 |
| 2016 | 148787.9701 | 5854720.754 | 3081.891397 |

Model 5:

The fifth model projects the future COE prices for Category E which includes other vehicles for the years 2012 to 2016.

$$y = 327710.2885 + 64.8897x_1 - 0.2331x_2$$

y is the future COE prices

x_1 is the total motor vehicle population

x_2 is the total population

| <u>Year</u> | <u>Motor Vehicle population</u> | <u>Total Population</u> | <u>COE prices</u> |
|-------------|---------------------------------|-------------------------|-------------------|
| 2012 | 25350.6 | 5362700.75 | 67236.9955 |
| 2013 | 26023.08 | 5462560.87 | 87596.62698 |
| 2014 | 26773.664 | 5585598.901 | 107621.6325 |
| 2015 | 27482.4912 | 5723599.356 | 121449.3109 |
| 2016 | 28163.58096 | 5854720.754 | 135080.6231 |

VI) News paper articles

Inflation continues to rise

Holiday travel, food, housing costs push October CPI to 5.4 per cent



by Teo Xuanwei

04:46 AM Nov 24, 2011

SINGAPORE - Inflation here has proven stickier than what some experts thought, after the Consumer Price Index (CPI) last month rose at a pace faster than expected.

According to figures from the Department of Statistics yesterday, the CPI last month was 5.4 per cent - the fifth straight month that inflation has exceeded 5 per cent - compared to the same period last year, largely due to more expensive accommodation, food, as well as holiday travel.

The gain was higher than a median 5.2 per cent rise forecast in a Dow Jones Newswires poll of 10 economists.

Inflation in September was 5.5 per cent compared to the same period last year.

On a month-on-month basis, the Monetary Authority of Singapore (MAS) core inflation measure (which excludes the costs of accommodation and private road transport) was 0.3 per cent last month. On a year-on-year basis, the MAS core inflation measure was 2.3 per cent.

Compared to the same period last year, housing cost last month rose by 9.9 per cent because of costlier electricity tariffs and accommodation.

Last month, Certificate of Entitlement (COE) premiums surged across the board, days after the Land Transport Authority (LTA) announced a cut in the vehicle population growth rate. In particular, COEs for cars above 1,600cc as well as for smaller cars and taxis hit a 14-year high.

The significant increase in COE premiums and higher petrol prices also drove transport costs by up 10.5 per cent. Dearer prepared meals and fresh produce also saw food prices rise by 3.5 per cent.

According to the MAS, inflation will be about 5 per cent this year and between 2.5 and 3.5 per cent next year. It has said headline CPI will be close to 4 per cent in the first six months before easing to around 2 per cent in the second half.

Economists who spoke to Today concurred that inflation will likely ease only gradually, unless another supply-side shock strikes and causes the "fear factor" about the severity of the global slowdown to become more pronounced.

Demand for cars, despite the climbing COE prices, remains strong and wage pressures are not coming off as quickly because of the tight labour market, they noted.

Although Thailand's flood situation has improved, leading to some respite in food prices, CIMB Research economist Song Seng Wun said that the impending festive season could cause prices to remain firm,

Still, the weak external conditions will have knock-on effects and exert downward pressure on prices.

With slowing demand, commodity prices are expected to ease, economists said.

UOB senior economist Alvin Liew added that the domestic employment situation will also soften, given the Ministry of Trade and Industry's forecast of 1 to 3 per cent growth next year, thereby alleviating wage pressures.

High base effects from private transport and housing rents will also help, said Bank of America Merrill Lynch's Chua Hak Bin. Mr Chua expects inflation to dip below the 5 per cent mark in the first quarter next year.

"Unless car prices continue going up at the same rate, inflation should ease. Even if COE prices stay flat, the year-on-year effects will still wind down," he said.

In the latest COE bidding exercise yesterday, the premiums in most categories fell.

VII) Used Cars Econometrics Model

Data was taken from the below table:

Annual Vehicle Statistics 2011

TYPE AND NUMBER OF VEHICLES TRANSFERRED¹

| Type of Vehicles | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|------------------------------------|---------|---------|---------|--------|--------|--------|--------|--------|--------|---------|---------|
| Cars | 82,173 | 59,396 | 48,029 | 37,078 | 23,955 | 20,809 | 23,818 | 29,459 | 34,003 | 55,560 | 72,031 |
| Motorcycles | 48,172 | 48,515 | 45,278 | 42,982 | 42,984 | 37,811 | 34,553 | 34,078 | 32,911 | 33,213 | 37,352 |
| Buses | 1,030 | 1,201 | 1,103 | 1,310 | 1,031 | 1,012 | 1,170 | 1,212 | 1,226 | 1,426 | 1,766 |
| Goods & Other Vehicles | 15,138 | 12,672 | 10,675 | 10,377 | 9,977 | 12,275 | 13,646 | 12,736 | 12,522 | 14,681 | 15,320 |
| Tax Exempted Vehicles ² | 409 | 384 | 296 | 246 | 250 | 204 | 381 | 293 | 438 | 435 | NA |
| Total | 146,922 | 122,168 | 105,381 | 91,993 | 78,197 | 72,111 | 73,568 | 77,778 | 81,100 | 105,315 | 126,469 |

Note :

¹. Figures exclude taxis, trailers and temporary transfers to dealers.

². From 2011 onwards, tax exempted vehicles are included in respective vehicle categories.

Table 9: Model used to predict future transfers of cars 2012-2016

| Regression Statistics | | | | | | | | | |
|-----------------------|--------------|----------------|----------|---------|----------------|-----------|-------------|-------------|--|
| Multiple R | 1 | | | | | | | | |
| R Square | 1 | | | | | | | | |
| Adjusted R Square | 65535 | | | | | | | | |
| Standard Error | 0 | | | | | | | | |
| Observations | 4 | | | | | | | | |
| ANOVA | | | | | | | | | |
| | df | SS | MS | F | Significance F | | | | |
| Regression | 3 | 1174103049 | 3.91E+08 | #NUM! | #NUM! | | | | |
| Residual | 0 | 0 | 65535 | | | | | | |
| Total | 3 | 1174103049 | | | | | | | |
| | Coefficients | Standard Error | t Stat | P-value | Lower 95% | Upper 95% | Lower 95.0% | Upper 95.0% | |
| Intercept | 60248.60446 | 0 | 65535 | #NUM! | 60248.6045 | 60248.6 | 60248.6 | 60248.6 | |
| 14814.58333 | -16.93888353 | 0 | 65535 | #NUM! | -16.9388835 | -16.9389 | -16.9389 | -16.9389 | |
| 16086.8333 | 1.117589762 | 0 | 65535 | #NUM! | 1.11758976 | 1.11759 | 1.11759 | 1.11759 | |
| 16496.66667 | 11.4424809 | 0 | 65535 | #NUM! | 11.4424809 | 11.44248 | 11.44248 | 11.44248 | |

Equation of the above model:

$$y_{\text{transfers}} = 60248.60446 - 16.93888353x_1 + 1.117589762x_2 + 11.4424809x_3$$

where,

x_1 = Category A COE quota premium

x_2 = Category B COE quota premium

x_3 = Category E COE quota premium

Table 10: Model used to predict future transfers of Buses and Trucks 2012-2016

| SUMMARY OUTPUT | | | | | | | | |
|-----------------------|--------------|----------------|-------------|----------|----------------|-------------|-------------|-------------|
| Regression Statistics | | | | | | | | |
| Multiple R | 0.988745 | | | | | | | |
| R Square | 0.977617 | | | | | | | |
| Adjusted R Square | 0.966426 | | | | | | | |
| Standard Error | 300.217 | | | | | | | |
| Observations | 4 | | | | | | | |
| ANOVA | | | | | | | | |
| | df | SS | MS | F | Significance F | | | |
| Regression | 1 | 7873212.224 | 7873212 | 87.3537 | 0.011254813 | | | |
| Residual | 2 | 180260.5256 | 90130.26 | | | | | |
| Total | 3 | 8053472.75 | | | | | | |
| | Coefficients | Standard Error | t Stat | P-value | Lower 95% | Upper 95% | Lower 95.0% | Upper 95.0% |
| Intercept | 11896.24 | 386.2269168 | 30.80116 | 0.001052 | 10234.43762 | 13558.04 | 10234.43762 | 13558.04 |
| | 6666.41667 | 0.153114 | 0.016382274 | 9.34632 | 0.011255 | 0.082626745 | 0.223601 | 0.082626745 |

Equation of the above model:

$$y_{transfers} = 11896.24 + 0.153114x_1$$

where,

$$x_1 = \text{Category C COE quota premium}$$

Table 11: Model used to predict future transfers of Motorcycles 2012-2016

| Regression Statistics | | | | | | | | |
|-----------------------|--------------|----------------|-------------|----------|----------------|-------------|-------------|-------------|
| Multiple R | 0.896883712 | | | | | | | |
| R Square | 0.804400394 | | | | | | | |
| Adjusted R Square | 0.706600591 | | | | | | | |
| Standard Error | 1232.985739 | | | | | | | |
| Observations | 4 | | | | | | | |
| ANOVA | | | | | | | | |
| | df | SS | MS | F | Significance F | | | |
| Regression | 1 | 12504041.34 | 12504041 | 8.224969 | 0.103116287 | | | |
| Residual | 2 | 3040507.664 | 1520254 | | | | | |
| Total | 3 | 15544549 | | | | | | |
| | Coefficients | Standard Error | t Stat | P-value | Lower 95% | Upper 95% | Lower 95.0% | Upper 95.0% |
| Intercept | 28600.83427 | 2026.92747 | 14.11044 | 0.004985 | 19879.66926 | 37322 | 19879.6693 | 37321.999 |
| | 1130.83333 | 3.925276596 | 1.368683772 | 2.867921 | 0.103116 | -1.96369437 | 9.814248 | -1.9636944 |

Equation of the above model:

$$y_{transfers} = 28600.83427 + 3.925276596x_1$$

where,

$$x_1 = \text{Category D COE quota premium}$$

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